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UNITED STATES DEPARTMENT OF AGRICULTURE

Soil Survey
of
Brunswick County, North Carolina

By

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United States Department of Agriculture, in Charge

and

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North Carolina Department of Agriculture
and North Carolina Agricultural Experiment Station

Bureau of Chemistry and Soils

In cooperation with the
North Carolina Department of Agriculture
and
North Carolina Agricultural Experiment Station

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SOIL SURVEY OF BRUNSWICK COUNTY, NORTH CAROLINA

By S. O. PERKINS, United States Department of Agriculture, in Charge, and E. F. GOLDSTON, North Carolina Department of Agriculture and North Carolina Agricultural Experiment Station

COUNTY SURVEYED

Brunswick County is the southernmost county in North Carolina. It borders the Atlantic Ocean and the South Carolina State line (fig. 1). Cape Fear River forms the eastern and northeastern boundaries. Southport, the county seat, is 30 miles south of Wilmington. It is located at the mouth of Cape Fear River, which is locally known as the "Gateway to the Sea." The area of the county is 854 square miles, or 546,560 acres.

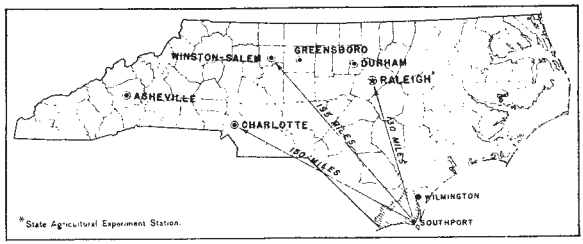

FIGURE 1.—Sketch map showing location of Brunswick County, N. C.

This county is in the flatwoods section of the Atlantic Coastal Plain, and its physiographic features are dominantly those of a level plain. In general, the relief is level, undulating, or gently rolling, but the rolling parts include many slight depressions and swampy areas. One large swamplike level area, known as Green Swamp, covering more than 100 square miles, lies in the western part of the county, and there are several large flat bodies, locally called bays. The larger bays are between Southport and Bolivia, between Shallotte and Longwood, south of Funston, and between Winnabow and Shiloh Church; and numerous smaller bays are scattered throughout the county. The bays appear to lie at a lower elevation than the surrounding areas, but in reality they are higher and are the sources of most of the drainageways. Low swampy areas occur along most of the streams. Large areas of this lowland lie along Brunswick, Cape Fear, Waccamaw, Lockwood Folly, Shallotte, and Elizabeth Rivers and along Town, Juniper, Big Swamp, and other creeks. The land bordering the swampy areas along most of the larger branches, creeks, and rivers is gently rolling and undulating. The largest areas of rolling land are along Orton Pond, Allen Creek, Hood Creek, and Lockwood Folly River.

The county as a whole is poorly drained, and large areas retain a simple constructional surface form without adequate natural drainage. Cape Fear, Waccamaw, Shallotte, and Lockwood Folly Rivers

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and Town Creek, all of which flow in a southerly direction and empty into the Atlantic Ocean, are the main drainage channels. The undulating and gently rolling land, which constitutes from 25 to 30 percent of the county, has good surface and internal drainage. Some of the level land is fairly well drained, but the greater parts of the broader areas have poor or practically no drainage. Some small areas, however, have been economically drained by open ditches. Most of the large level areas would require large drainage canals supplemented by open ditches, and such a system would be rather expensive. Numerous ponds are scattered throughout the rolling areas in the eastern part of the county.

The elevation of the county ranges from sea level to about 80 feet above. The elevation [1] at Southport is 18 feet; at Navassa in the northeastern part, 10 feet; and at North West, 46 feet. The elevation of the upland bordering the level swampy land along the streams ranges from 5 to 15 feet, and the slopes are gradual, except in a few places along Cape Fear River, where the drop is abrupt and there are a few low bluffs.

Much of the land is forested, principally with longleaf pine, shortleaf pine, pond pine, red, black, white, post, water, live, and turkey oaks, maple, black gum, sweetgum, tupelo gum, hickory, dogwood, poplar, holly, black walnut, cedar, cypress, and juniper. Many of the longleaf pine forests are open and practically free from undergrowth, but the greater part of the forested area supports a heavy undergrowth of bay, gallberry, reeds, briers, myrtle, and, near the ocean, some yaupon, and on Smith Island some palmetto. Many other water-loving shrubs and grasses grow on the wet and bog areas and tidal marsh, principally wire grass, sedges, ram's-horn, cattail, bulrush, marsh grasses, pitcherplant, and Venus's flytrap. The forest growth in Brunswick County is definitely related to the soils. The Leon soils support a growth of longleaf pine almost entirely, and longleaf pine, oaks, shortleaf pine, poplar, dogwood, cedar, black gum, and sweetgum grow on the Blanton, Dunbar, Coxville, Bladen, Norfolk, and Craven soils. The hardwoods, with a few scattered pines, grow chiefly on the Ruston, Onslow, Dunbar, Norfolk, and Craven soils; pond pine, baybushes, some tupelo gum, and maple grow on the Portsmouth and St. Johns soils; and cypress, tupelo gum, poplar, juniper, maple, water oak, cedar, and a few pines grow on peat, muck, and swampland.

Brunswick County was organized in 1764 from parts of Bladen and New Hanover Counties, and in 1808 a part of it was taken to form Columbus County. The early settlers were chiefly persons of English descent from South Carolina. According to the 1930 United States census report, the population of the county in that year was 15,818, all classed as rural. The same census reports 9,890 white persons and 5,928 Negroes. The density of the population is 21 persons a square mile. The population is not evenly distributed. It is very sparse in the central and western parts of the county. Most of the people live along the highways on the better drained soils and near the ocean. Southport, the county seat, with a population of 1,760 in 1930, is the only incorporated town, and important villages

[1] GANNETT, H. A DICTIONARY OF ALTITUDES IN THE UNITED STATES. U. S. Geol. Survey Bull. 274, ed. 4, 1072 pp 1906.

and trading points are Shallotte, Supply, Longwood, Leland, and Freeland, which are markets for only a small proportion of the farm products. Whiteville and Wilmington are important outside markets. Most of the shad, shrimp, and other products of the coast fisheries are shipped to northern markets.

Railway transportation for the greater part of the county is poor. The northern part is traversed by the Atlantic Coast Line Railroad and Seaboard Air Line Railway, and the Wilmington, Brunswick & Southern Railroad extends from Wilmington to Southport. The Atlantic Ocean; Cape Fear, Lockwood Folly, and Shallotte Rivers; and Town Creek afford water transportation. Three main hard-surfaced roads, two of which are United States highways, serve the county, and the other roads are in fair condition in dry weather. Rural delivery of mail reaches all sections; churches and schoolhouses are conveniently located, but the telephone service has not been extended to all parts. The water supply is good, and a few flowing artesian wells are near some of the streams.

In addition to agriculture, the industries of the county include the catching and shipping of fish, shrimp, and oysters, and the manufacture of fish scrap and oil. Considerable turpentine is produced from the pine forests.

CLIMATE

Brunswick County borders the Atlantic Ocean and Cape Fear River from Wilmington to its mouth. The climate is oceanic, that is, it is affected by the Gulf Stream and ocean breezes, and this fact probably accounts for a higher winter temperature than in any other county in the State. Very cold weather is infrequent and of short duration, the winters are short and mild, the ground rarely freezes deeper than just a thin layer on the surface, and snow, which seldom falls, soon melts.

The summers are long and, according to the temperatures recorded, would seem hot, but, on account of the sea breezes, the heat near the coast is not felt to so great a degree as it is farther inland. The average length of the frost-free season is 241 days, from March 19 to November 15. Frost has been recorded as late as April 20 and as early as October 25. The mean annual temperature at Southport is 64.1° F.

The rainfall is well distributed throughout the year, the heaviest occurring during the growing season. The mean annual rainfall is 49.74 inches, which is ample for all crops commonly grown. Excessive rainfall or droughts are rare.

In general, the climate is such that a variety of crops can be grown, and cover crops, lettuce, turnip greens, and broccoli, can be grown during the winter. More than one crop can be matured on the same land in the same year, and the climate is especially suited to the production of truck crops. Farm operations are carried on throughout the year.

Table 1 gives the normal monthly, seasonal, and annual temperature and precipitation as recorded at the United States Weather Bureau Station at Southport.

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation at Southport, Brunswick County, N. C.*

[Elevation, 18 feet]

Month	Temperature			Precipitation		
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1923)	Total amount for the wettest year (1929)
	° *F.*	° *F.*	° *F.*	*Inches*	*Inches*	*Inches*
December	49.3	75	5	3.60	2.20	5.33
January	47.3	76	6	3.80	3.91	5.45
February	48.9	75	1	4.03	2.02	6.60
Winter	48.5	76	1	11.43	8.13	17.38
March	54.6	89	20	3.54	3.49	2.83
April	62.0	92	29	2.96	1.32	1.82
May	70.8	96	38	3.33	1.53	5.21
Spring	62.5	96	20	9.83	6.34	9.86
June	77.4	98	50	4.43	.82	3.55
July	80.4	103	55	6.58	5.67	3.84
August	79.7	100	57	5.70	2.47	10.51
Summer	79.2	103	50	16.71	8.96	17.90
September	75.5	95	40	4.77	3.01	9.29
October	66.2	90	32	4.34	1.94	8.09
November	56.6	83	17	2.66	3.06	3.33
Fall	66.1	95	17	11.77	8.01	20.71
Year	64.1	103	1	49.74	31.44	65.85

AGRICULTURAL HISTORY AND STATISTICS

The first agricultural development in that part of the State now included in Brunswick County was begun about 1725 or 1728 by the early settlers who occupied the higher lands on the west side of Cape Fear River. The first crops grown were rice, indigo, corn, potatoes, garden vegetables, and tobacco. The raising of cattle, hogs, sheep, and poultry was soon introduced, and the numbers of these increased until about the time of the Civil War. Under the old land grants the farms were called plantations, and several large plantations occupied the country between Orton and Wilmington. Most of the rice was grown on the lowlands along Cape Fear River between Wilmington and Orton. Considerable income was derived from turpentine and rosin for a number of years, and later from the sale of lumber. A self-sufficing type of agriculture was practiced on these farms by the early settlers.

According to the United States census, rice was a crop of considerable importance in 1879 and reached its greatest production by 1899, but after that time rice growing declined rapidly. By 1909 only 248 acres were planted to rice, and in the year of the survey (1932), none.

The acreage devoted to cotton steadily increased from 375 acres in 1879 to 2,687 acres in 1919, but the 1935 census reports only 399 acres in 1934. Sweetpotatoes have been an important crop since the early settlement of this section. The increase in both acreage and yield has been steady, and the 1935 farm census reports 2,417

acres devoted to the production of this crop in 1934. Only 7 acres of tobacco were reported for 1879, whereas for 1934 there were reported 1,534 acres, yielding 1,248,295 pounds.

The production of corn increased rapidly from 4,915 acres in 1879 to 9,180 acres in 1899 and remained rather steady until 1929. The census of 1935 reports 11,472 acres planted to corn in 1934. This large increase is probably due in part to the restrictions placed on the acreages devoted to tobacco and cotton.

The acreages of the principal crops in Brunswick County, as reported by the Federal census for the years 1879 to 1934, inclusive, are given in table 2.

TABLE 2.—*Acreage of the principal crops in Brunswick County, N. C., in stated years*

Crop	1879	1889	1899	1909	1919	1929	1934
	Acres	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*
Corn	4,915	7,278	9,180	8,887	8,374	9,332	11,472
Oats	240	159	207	385	327	93	190
Sweetpotatoes	1,523	2,109	2,377	2,459	2,088	2,039	2,417
Peanuts		886	1,726	3,128	1,238	3,903	
Dry peas			528	638	290	1,090	
Rice	1,489	1,328	2,327	248			15
Tobacco	7	1	15		827	1,326	1,534
Cotton	385	1,049	1,004	1,950	2,687	710	399
Hay and forage	25	90	353	1,197	5,908	2,814	4,537
	Trees	*Trees*	*Trees*	*Trees*	*Trees*	*Trees*	*Trees*
Apples		1,705	7,753	7,613	7,699	6,001	
Peaches		297	3,040	3,586	13,641	4,393	
Pears		106	1,957	3,675	2,322	2,257	

Peanuts were reported for the first time in 1889 when 886 acres were planted, and the acreage had increased to 3,903 acres in 1929 and has probably further increased up to the present time. The increase in the production of hay and forage crops has been rapid. Some oats are grown, but this crop has never been of great importance. There are many apple, peach, and pear trees on the farms, but practically all the fruit is used in the homes.

The 1935 census reports 203 horses, 1,300 mules, 2,584 cattle, 248 sheep, 475 goats, and 9,097 swine, on January 1 of that year. Considerable revenue is derived from the sale of hogs, chickens, eggs, and garden vegetables.

Commercial fertilizers are in general use on practically all the cultivated soils. The amount spent in 1929, according to the census, was $90,382 on 1,161 farms reporting such expenditure. Most of the fertilizers are bought ready mixed, and the principal mixtures used range from 3–8–3 [2] or 4–8–4 to a higher grade mixture like 7–5–7, depending on the character of the soil and the kind of crop grown. Some farmers apply nitrate of soda as a top dressing, and a few apply lime or oystershells.

Farm labor, including both white and colored workers, is plentiful and can usually be obtained at a reasonable wage. The rate of wages for both day laborers and monthly employees depends on economic conditions and the demand for labor in the industrial plants.

[2] Percentages, respectively, of nitrogen, phosphoric acid, and potash.

Cropland harvested in 1934, as reported by the farm census, including land devoted to hay and forage crops, garden vegetables, nuts, and fruits, aggregated 23,574 acres. The farms are for the most part small, and, according to the census of 1935, the average-sized farm includes 83.3 acres. The number of farms in 1935 was 2,079, showing an increase of 560 since 1930. The farms range in size from 5 to 500 acres, but usually only 20 or 25 acres are in cultivation on the average-sized farm. Several large holdings, mainly forest land, range in size from 5,000 to 30,000 acres. A considerable acreage is devoted to pasture.

According to the 1935 census, 83 percent of the farms are operated by owners, 16.7 percent by tenants, and 0.3 percent by managers. A few of the rented farms are operated under the share-rental system, under which the landlord furnishes the work animals, feed, implements, seed, and one-half of the fertilizer and in return receives one-half of the crop produced. Where the landlord furnishes the land and seed and one-third of the fertilizer, he receives one-third of the crop which is usually tobacco, cotton, and corn.

The greater number of the farmhouses, except some of those more recently constructed and some of the old-type ante-bellum homes, are small. Several large and also some small attractive well-painted farmhouses are scattered throughout the county. The farm equipment on the larger farms includes tractors, manure spreaders, lime distributors, riding tobacco transplanters, and peanut pickers, but the equipment on most farms consists of one-horse plows, small cultivators, cotton, corn, and peanut planters, and stalk cutters. The light sandy soils do not require heavy farm machinery or unusually strong work animals. Most of the work animals are mules. Most of the hogs raised are Duroc-Jersey, Berkshire, and Poland China, and the milk cows are mainly of the Jersey and Guernsey breeds or grades of these breeds.

Brunswick County includes large areas of muck and peat in the pocosins, large swamp areas, and a large aggregate area of fine sand. The value of these miscellaneous land types varies, according to the amount of merchantable timber the land supports or the stand of second-growth trees. The selling prices of good farming land vary, depending on the improvements, the location, the amount of cleared or drained land, and the character of the soils.

SOILS AND CROPS

Brunswick County is one of the largest counties in North Carolina. It lies in that part of the State known as the seaward part or flatwoods section. The relief is predominantly level, with a gradual slope toward the south. Drainage over a large part of the county is poor, as many of the high flat areas have never been invaded by streams.

About 31,330 acres, or 5.7 percent of the total area of the county, are available for cultivation and used for the production of farm crops. The soils have been developed under a forest cover. The greater part of the land is cut-over land, except some land on the Orton, Gore, and Bellamy plantations. Most of the original merchantable timber has been marketed, but in many places where the

soils are favorable for tree growth there is a good stand of second-growth trees. Much of the second growth consists of pine trees which are boxed for turpentine. One large turpentine still is located in the county.

The proportion of the land actually farmed is much smaller than the average for the higher lying coastal-plain counties of North Carolina. This is due to a number of factors, such as poor drainage; large areas of various kinds of fine sands which are inherently poor and unsuited to farming purposes; a large number of holdings, ranging from 5,000 to 30,000 acres, which are included in game preserves and timber holdings; and also to the fact that a considerable acreage, probably 170 square miles, is included in the numerous bays, swamps, and marshes, all of which are unfit to produce crops. A large part of the southern, southwestern, and western parts of the county are remote from railroad transportation, and until recently no good highways traversed these sections. A large area still remains, particularly in the Green Swamp section, which is not reached by roads of any kind. Large areas of the Bladen, Coxville, Hyde, Portsmouth, Congaree, and Ochlockonee soils are barred from agricultural use on account of poor natural drainage.

Brunswick County has some of the poorest also some of the best soils in the coastal-plain section of the State. They range from pure white sand to black loam. In most places a direct relationship exists between the underlying material, from which the soils through the soil-forming processes have been derived, and the present soils. These deposits range from fine sands through fine sandy clays to heavy clays, and in addition, over large areas organic material has accumulated to a depth of several feet, through the growth and decay of vegetation under swampy conditions over long periods of time.

The agriculture is confined largely to the better drained fine sandy loams, loams, and some of the fine sands. The principal crops are corn, as a subsistence crop, together with hay and forage crops, sweetpotatoes, tobacco, cotton, peanuts, some truck crops, and garden vegetables. The main cash crops are tobacco, sweetpotatoes, cotton, and vegetables. In addition to these crops, a small acreage is devoted to the production of potatoes, cowpeas, soybeans, oats, and rye. Truck crops, such as garden peas, cucumbers, cabbage, collards, lima beans, string beans, and strawberries, are produced for sale.

The cash crops grown here are those to which the climate and soils are suited, and they bring in the greatest cash returns and the largest acre profit of any crops that can be grown under present economic conditions. The farm owners understand the production of these crops, and the tenant farmers know how to grow good crops of cotton, peanuts, and tobacco. The climate is perhaps as well, if not better, suited as that of any county in the State for the production of early vegetables and truck crops. The light-textured well-drained fine sandy loam soils, such as the Norfolk, Ruston, and Dunbar, are well adapted to the production of a wide variety of truck crops, and the farmers seem to be putting these soils to the best possible use at present.

On the basis of their agricultural use, drainage conditions, and color, the soils of Brunswick County may be divided into five groups: (1) Light-colored well-drained fine sandy loams, (2) dark-colored

poorly drained fine sandy loams and loams, (3) black loams and fine sandy loams, (4) well-drained and poorly drained fine sands, and (5) organic soils and miscellaneous land types.

In the following pages the soils of this county are described in detail and their agricultural importance is discussed; their distribution is shown on the accompanying soil map; and their acreage and proportionate extent are given in table 3.

TABLE 3.—*Acreage and proportionate extent of the soils mapped in Brunswick County, N. C.*

Soil type	Acres	Per-cent	Soil type	Acres	Per-cent
Norfolk fine sandy loam	7,040	1.3	Onslow loamy fine sand	9,408	1.7
Norfolk fine sandy loam, deep phase	10,688	1.9	Blanton fine sand	43,520	8.0
Norfolk fine sandy loam, flat phase	1,920	.4	Leon fine sand	49,536	9.1
Norfolk sandy loam	576	.1	St. Lucie fine sand	1,024	.2
Craven fine sandy loam	896	.2	St. Lucie fine sand, brown-sub-stratum phase	6,208	1.1
Ruston fine sandy loam, deep phase	4,224	.8	Plummer fine sand	2,624	.5
Dunbar fine sandy loam	21,312	3.9	Portsmouth fine sand	28,992	5.3
Dunbar very fine sandy loam	6,720	1.2	Portsmouth fine sand, mucky phase	7,552	1.4
Onslow fine sandy loam	26,560	4.9	St. Johns fine sand	11,584	2.1
Bladen loam	26,496	4.8	Pamlico muck	5,824	1.1
Coxville loam	19,200	3.5	Pamlico muck, shallow phase	7,168	1.3
Coxville fine sandy loam	6,848	1.2	Peaty muck	34,112	6.2
Plummer fine sandy loam	24,512	4.5	Peat	33,984	6.2
Myatt fine sandy loam	896	.2	Swamp	36,032	6.6
Ochlockonee loam	4,480	.8	Meadow	6,720	1.2
Congaree silt loam	2,944	.5	Tidal marsh	17,024	3.1
Portsmouth fine sandy loam	33,408	6.1	Coastal beach	4,736	.9
Portsmouth loam	23,488	4.3	Coastal beach, dark-colored phase	1,024	.2
Hyde loam	3,712	.7			
Johnston loam	2,816	.5			
Norfolk fine sand	8,512	1.6			
Norfolk sand	1,472	.3	Total	546,560	
Ruston fine sand	768	.1			

LIGHT-COLORED WELL-DRAINED FINE SANDY LOAMS

The group of light-colored well-drained fine sandy loams, including one type of sandy loam and one of very fine sandy loam, constitute the lightest colored and best drained agricultural soils in Brunswick County, in fact, they dominate the agriculture. Their combined area is 124.9 square miles, or 14.7 percent of the total area of the county. This group includes Norfolk fine sandy loam, with a deep phase and a flat phase; Norfolk sandy loam; Craven fine sandy loam; Ruston fine sandy loam, deep phase; Dunbar fine sandy loam; Dunbar very fine sandy loam; and Onslow fine sandy loam.

Owing to their position in the county, these soils are well defined, as they occur on the breaks of the streams and in undulating and gently rolling areas. Both surface drainage and internal drainage are good, except on Norfolk fine sandy loam, flat phase, Dunbar very fine sandy loam, and a part of Onslow fine sandy loam. These semi-drained soils occupy slightly higher elevations on the broad flat or undulating areas lying back of the better drained soils, but they are included in the group of well-drained soils because they have somewhat better drainage than the poorly drained soils. In most places, open ditches leading into the natural drainageways would furnish ample drainage for them.

The original merchantable timber consisted mainly of longleaf and loblolly pines, most of which has been cut, and the second growth is chiefly longleaf and shortleaf pines and white, red, black, post, and

live oaks, together with some hickory, dogwood, sweetgum, cedar, black walnut, and holly.

These soils are characterized by light-gray or grayish-yellow surface soils having a fairly uniform texture of loamy fine sand, with one small area of loamy sand. They are classed as fine sandy loams because they have fine sandy clay subsoils. In the soils of the Norfolk and Ruston series, the subsoils are fine sandy clays of yellow and reddish-yellow colors, respectively, whereas the Craven and Dunbar soils have much heavier subsoils which are not so uniform in color. The subsoils in all these soils are capable of retaining much of the rainfall, thus maintaining good moisture conditions for growing plants.

The soils of this group, because of their open mellow surface soils and the friability of their subsoils, warm up early in the spring and are the first on which agricultural operations begin. They are all naturally low in organic matter, as indicated by their light color, and they are leached of most of the soluble plant nutrients, but their physical properties are so favorable that they respond readily to fertilization and produce the most profitable crops grown in this county. They are the best soils for the production of bright-leaf tobacco, cotton, peanuts, sweetpotatoes, and early truck crops. The climate, together with the soils, favors the production of a wide variety of truck and garden crops, and there is no reason why the growing of truck crops should not be expanded if and when there is sufficient demand.

All the soils of this group are very easily tilled and require only shallow plowing and cultivation. Hand tools, as well as improved machinery, can be used advantageously, and lightweight work animals meet the requirements for breaking and tilling the land.

Norfolk fine sandy loam.—Although Norfolk fine sandy loam is of comparatively small acreage, it is one of the best soils in the county for the production of bright-leaf tobacco, cotton, sweetpotatoes, peanuts, and early truck crops, and it is one of the most desirable soils developed in the Atlantic Coastal Plain section of the State.

The surface layer, to a depth of 5 or 7 inches, or to the depth of ordinary plowing in cultivated fields, is light-gray or grayish-yellow loamy fine sand. It is underlain by pale-yellow loamy fine sand or light fine sandy loam, which extends to a depth of 12 or 15 inches. The subsoil is yellow fine sandy clay which is friable and crumbly, of uniform color, and extends to a depth ranging from 30 to 35 inches. This layer, in turn, is underlain by mottled light-gray, light-red, and yellow rather heavy fine sandy clay material which is slightly sticky in some places but in other places is rather hard and brittle. Locally the surface soil of loamy fine sand extends to a depth of 20 inches, but in other places the covering of loamy fine sand over the yellow fine sandy clay is only 8 or 10 inches thick. Where Norfolk fine sandy loam adjoins Dunbar fine sandy loam or some of the other soils having heavier subsoils, the Norfolk subsoil is mottled at a depth ranging from 24 to 30 inches and is heavier than the typical subsoil. In some places where organic matter has been incorporated, the surface soil, to a depth of about 6 inches, is dark gray. In

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wooded areas the topmost 2 or 3 inches of the surface soil are gray or dark gray, owing to the presence of organic matter. In mapping areas of Norfolk fine sandy loam on the small-scale map used, it was necessary to include small spots of Norfolk fine sandy loam, deep phase, Norfolk loamy fine sand, Dunbar fine sandy loam, and Craven fine sandy loam.

The greater part of this soil occurs in the vicinities of Leland and North West, and along the Columbus County line in the northwestern part of the county. A few smaller areas are scattered here and there over the well-drained sections. The relief ranges from almost level to gently sloping. Most of the land is well drained, but in the flatter areas open ditches are necessary to carry off the excess rain water. The little surface erosion that has taken place is confined to some of the steeper breaks bordering swamps or marshy areas.

Probably 70 percent of the land is cleared and under cultivation, and the rest supports a growth of longleaf and shortleaf pines, together with a few scattered oak, dogwood, hickory, and other trees. Of the land under cultivation, 40 percent is devoted to the production of corn, 10 percent to tobacco, 10 percent to sweetpotatoes, 10 percent to peanuts, 20 percent to hay and legumes, and 10 percent to early truck crops. English peas, beets, cabbage, and string beans are the main vegetable crops grown for market.

Yields of corn range from 15 to 40 bushels an acre, depending on the fertilizer applied and previous treatment of the soil. The usual acre fertilization for corn is from 300 to 400 pounds of 3–8–3 fertilizer and 100 pounds of nitrate of soda as a top dressing. Tobacco yields from 500 to 1,000 pounds an acre and is usually given an acre application ranging from 800 to 1,200 pounds of 3–8–3 or 4–8–5 fertilizer. Sweetpotatoes yield from 80 to 250 bushels an acre and are given from 400 to 1,000 pounds an acre of 3–8–3 or 5–7–7 fertilizer. Peanuts produce from 40 to 70 bushels an acre and are usually fertilized with from 300 to 500 pounds of 2–8–2 fertilizer and 400 pounds of land plaster when the plants are in bloom. Hay and legume crops do well when the land is fertilized or manured.

Norfolk fine sandy loam, in addition to being an excellent soil for the production of the crops mentioned, is also well suited to the production of scuppernong grapes, crimson clover, Austrian winter peas, and velvetbeans. The soil is very easy to cultivate, readily absorbs rain water, drains quickly, and, on account of the fine sandy clay subsoil, holds moisture well. It responds to applications of commercial fertilizers and manures and the turning under of green-manure crops.

Norfolk fine sandy loam, deep phase.—The deep phase of Norfolk fine sandy loam occurs in close association with the typical soil and in some places with Norfolk fine sand. The largest areas lie in the vicinities of Leland and North West in the northeastern part of the county, and several small bodies are scattered in other parts. Soil of this phase differs essentially from typical Norfolk fine sandy loam in that it has a thicker loamy fine sand surface layer and is pale yellow or grayish yellow. The subsoil, commencing at a depth of about 22 or 24 inches, is yellow friable fine sandy clay which, at a depth ranging from about 32 to 36 inches, grades into mottled yellow, light-red, and gray fine sandy clay material.

Because of its small total extent, although it occurs in a number of small widely scattered bodies, Norfolk loamy fine sand has been included with Norfolk fine sandy loam, deep phase, in mapping. The largest areas of the loamy fine sand lie west of the mouth of Shallotte River along Saucepan Creek. This soil is loamy fine sand to a depth of 28 or 30 inches, where it grades into yellow very fine sandy loam or light fine sandy clay, and in some places it is underlain by loose fine sand.

The deep phase of Norfolk fine sandy loam is used for practically the same crops as is typical Norfolk fine sandy loam, but yields under the same fertilizer treatment and cultural methods are somewhat lower. The included areas of Norfolk loamy fine sand are less productive under the same treatment. This deeper soil is well suited to the production of bright-leaf tobacco, peanuts, and early truck crops. It requires heavy applications of commercial fertilizers to produce fair yields. Owing to the thickness of the loamy fine sand over the fine sandy clay subsoil, it can be built up to a higher state of productivity through incorporation of organic matter than can Norfolk fine sand but not to the same extent as typical Norfolk fine sandy loam.

Norfolk fine sandy loam, flat phase.—Norfolk fine sandy loam, flat phase, differs from typical Norfolk fine sandy loam in that it has a nearly level relief and is not so well drained. The topmost few inches of the surface soil are somewhat darkened, owing to the presence of organic matter. This layer is underlain by yellow or pale-yellow loamy fine sand to a depth ranging from 10 to 15 inches. The subsoil begins as yellow fine sandy clay, but it becomes mottled yellow, light gray, and light red at a depth ranging from 20 to 30 inches. In most places it is slightly heavier than the subsoil of typical Norfolk fine sandy loam, and in color it resembles the subsoil of the well-drained Dunbar fine sandy loam.

Practically all of Norfolk fine sandy loam, flat phase, occurs in the northeastern part of the county in the vicinity of North West and along the Columbus County line.

Owing to the flatness of the land, surface drainage ranges from fair to poor. Open ditches are necessary to remove the excess rain water and to render this soil suitable for cultivation. Only a very small acreage is under cultivation. When drained and aerated the land will produce fair yields of corn, cotton, and velvetbeans, if it is fertilized. Tobacco will not do so well on this poorly drained soil as on the better drained soils. The farmed areas are given about the same fertilization, the same methods of cultivation are practiced, and yields of the staple crops are not materially different from those obtained on typical Norfolk fine sandy loam.

Norfolk sandy loam.—Norfolk sandy loam occupies a very small acreage, all of which is in the northeastern part of the county north of Leland and about 1 mile northeast of Phoenix. The relief ranges from almost level to undulating, and the land is fairly well drained, although some of the flatter parts would be improved by open ditches.

Norfolk sandy loam differs essentially from Norfolk fine sandy loam in the texture of both the surface soil and subsoil, as both contain a considerable amount of medium and coarse sand.

Only a small acreage of this soil is under cultivation. Crop yields, fertilizer applications, and general cultural methods in use on this soil are practically the same as those on Norfolk fine sandy loam.

Craven fine sandy loam.—Craven fine sandy loam also occupies a very small acreage. Most of this soil occurs in several small areas along United States Highway No. 117 southwest of Shallotte, three small areas in the vicinity of Supply, and others bordering Orton Pond on the north. The relief ranges from undulating to gently sloping, and the land has good natural surface drainage. It is easily differentiated from Norfolk fine sandy loam in that the subsoil is heavy clay.

The 3- to 6-inch surface layer of Craven fine sandy loam consists of gray or grayish-yellow fine sandy loam or loamy fine sand. It grades into pale-yellow fine sandy loam which extends to a depth of 8 or 10 inches. The subsoil is yellow or pale-yellow rather heavy sticky clay or sticky heavy fine sandy clay, which continues downward to a depth ranging from 20 to 28 inches. Below this is mottled light-gray, yellow, and yellowish-red heavy rather tough clay which continues to a depth ranging from 4 to more than 5 feet. In a few places the surface soil ranges from 5 to 8 inches in thickness, particularly in the more sloping areas where a part of the sandy surface layer has been removed by sheet erosion. The heavy subsoil does not absorb water readily, and, as soon as the soil has become saturated, erosion takes place.

Included with mapped areas of Craven fine sandy loam are a few small bodies in which the fine sandy loam surface soil is very shallow and in places it has been removed entirely, exposing the tough slightly plastic variegated or mottled light-red, yellow, purple, and gray clay. On drying, this material cracks into cubical blocks. These included areas occur for the most part on the slopes of streams, the larger bodies being on the north side of Orton Pond and along Shallotte River near Shallotte. Such spots have no agricultural value except, possibly, for growing trees.

Craven fine sandy loam in its typical development is a good soil, but it does not drain so readily or warm up so quickly in the spring as Norfolk fine sandy loam, owing to the heavy character of the subsoil. On the other hand, it retains fertilizers, holds manures and any other organic matter which have been applied, and can be built up to a fair state of productivity. The few areas of this soil in Brunswick County are used for practically the same crops, are fertilized in the same way, and the same cultural methods are in use as on Norfolk fine sandy loam.

Ruston fine sandy loam, deep phase.—Ruston fine sandy loam, deep phase, includes a total area of 6.6 square miles. It borders the larger streams and swamps and is exceptionally well drained, as the relief is rolling. The largest bodies lie along Cape Fear River just north and south of the mouth of Walden Creek, along Lockwood Folly River, Royal Oak Swamp, and Town Creek. This is the most maturely developed soil in the county, that is, oxidation of the subsoil is further advanced than that of any other soil.

The surface layer in cultivated fields is brownish-yellow loamy fine sand, ranging from 8 to 15 inches in thickness. It is underlain by pale-yellow loamy fine sand which in most places extends to a

depth ranging from 22 to 25 inches. This material is underlain rather abruptly by the reddish-brown or yellowish-brown friable fine sandy clay subsoil, and, at a depth ranging from 38 to 45 inches, this heavy layer, in turn, is underlain by material lighter in color and texture, which, at a depth of about 4 feet, passes into pale-yellow fine sand. In places the subsoil begins at a depth ranging from 15 to 20 inches, and such areas would have been mapped as typical Ruston fine sandy loam had they been of sufficient size to show separately on the soil map.

Probably 65 percent of Ruston fine sandy loam, deep phase, is under cultivation. The principal crops are corn, soybeans, peas, watermelons, tobacco, and vegetables. This soil is a little more desirable than Norfolk fine sandy loam, deep phase. It is well managed, and crop yields are almost equal to those obtained on the Norfolk soil. Watermelons do exceptionally well on the Ruston soil. Fertilization and cultural methods are the same as on Norfolk fine sandy loam.

Dunbar fine sandy loam.—In cultivated fields the 5- to 7-inch surface layer of Dunbar fine sandy loam is light-gray or grayish-yellow fine sandy loam or loamy fine sand. It is underlain by yellow or grayish-yellow heavy fine sandy loam which extends to a depth ranging from 10 to 14 inches. Below this is mottled yellow and light-gray rather heavy fine sandy clay or clay, which is slightly plastic and contains splotches of bright red. In most places, at a depth ranging from 36 to 40 inches, the gray and red colors become more pronounced and less yellow is present. In wooded areas the surface soil, to a depth of 3 or 5 inches, is dark gray, owing to the presence of organic matter. In some places the surface soil is only 6 or 8 inches thick, the pale-yellow subsurface layer being absent, and it grades directly into the typical heavy fine sandy clay subsoil. Locally, in small areas the subsoil is reddish-brown, mottled with gray, heavy clay. Included with this soil as mapped are small spots of Dunbar very fine sandy loam and Coxville fine sandy loam.

Dunbar fine sandy loam is widely scattered over the county, the largest areas occurring near and northeast of Bolivia, and around, west, and northwest of Shallotte. The total area is 33.3 square miles. This soil has developed for the most part on the almost level or undulating interstream divides. The relief of the greater part of the land is nearly level, and the land slopes gradually toward the natural drainageways. Although this soil has been classed in the group of well-drained soils, it is not everywhere well drained. On more nearly level areas open ditches are necessary to drain the land, in order to render it suitable for crop use.

This is one of the most important agricultural soils in the county, and probably a greater proportion of it than of any other soil is under cultivation. This soil, together with the associated Dunbar very fine sandy loam, constitutes a large part of the farming land.

The principal crops are corn, sweetpotatoes, soybeans, cotton, and peanuts, together with some tobacco and garden vegetables. Where properly drained the land will produce as high yields of corn, peanuts, soybeans, and sweetpotatoes as Norfolk fine sandy loam under similar cultural methods. Acre yields of corn range from 20 to 40

bushels where from 200 to 400 pounds of 3–8–3 fertilizer and 100 pounds of nitrate of soda have been applied. Cotton yields from one-fourth to three-fourths of a bale and usually receives from 300 to 500 pounds of 3–8–3 or 4–8–5 fertilizer. Some farmers apply nitrate of soda as a top dressing. Sweetpotatoes yield well on the lighter textured areas and are usually fertilized with from 800 to 1,000 pounds of 5–7–5 fertilizer. Some tobacco is grown on the better drained areas or those having a deep fine sandy loam surface soil, and some is grown on the areas of heavier soil, not because the soil is well suited to its production, but because the farmers need a cash crop and tobacco seems to meet this demand. Fertilizer for tobacco ranges from 400 to 800 pounds an acre of a 3–8–3 or 5–7–5 mixture. Peanuts give fair returns and usually receive an acre application ranging from 300 to 500 pounds of 2–8–2 fertilizer and about 400 pounds of land plaster at blooming time. A few cowpeas and soybeans are grown, and these do well when fertilized or planted with other crops which are fertilized. Some oats and pasture grasses are also grown. Strawberries do fairly well but do not produce quite so well as on Coxville fine sandy loam.

This soil ranges from medium acid to strongly acid, and for the best growth of leguminous crops, such as clovers, from 1 to 2 tons of lime are necessary to neutralize the acidity. By turning under green-manure crops, together with the proper rotation of crops, the land can be brought to a fair state of productivity. The subsoil is of such character that it holds fertilizers and manures well. The soil has fairly good moisture-holding capacity. It is easy to cultivate but does not warm up or drain so quickly as Norfolk fine sandy loam.

Dunbar very fine sandy loam.—Dunbar very fine sandy loam is gray or grayish-yellow very fine sandy loam to a depth ranging from 4 to 6 inches, or the depth of plowing. This layer is underlain by a 4- to 6-inch layer of pale-yellow or grayish-yellow heavy very fine sandy loam. The upper subsoil layer consists of yellow rather heavy friable very fine sandy clay extending to a depth ranging from 14 to 18 inches, and the lower subsoil layer is mottled red, yellow, and gray heavy slightly plastic clay which continues to a depth ranging from 3 to 4 feet. In the lower part of the subsoil the red mottling may increase or the gray may be more pronounced, and in places this layer is underlain by mottled yellow, red, and gray material of variable texture and structure. In places the surface soil is rather shallow and rests directly on the subsoil, as the pale-yellow subsurface layer is absent. In a few places the subsoil begins as yellow, slightly mottled with gray and red, heavy very fine sandy clay or clay.

Dunbar very fine sandy loam occurs in level areas, and artificial drainage is necessary for best results in farming. The largest areas are in the central part of the county, in the vicinities of Bolivia and Mill Creek Church, and in the western part in the vicinity of Longwood. Smaller bodies are in other parts. The total area is 10.5 square miles.

The greater part of this soil is under cultivation. Corn, cotton, sweetpotatoes, soybeans, peanuts, and tobacco are the chief crops grown, all of which give satisfactory yields. The grade of tobacco

is not so good as on the lighter colored and lighter textured fine sandy loams. About 45 percent of this soil is planted to corn, 20 percent to sweetpotatoes, 15 percent to tobacco, 10 percent to peanuts, and 10 percent to other crops. Acre yields of corn range from 30 to 45 bushels, cotton one-half to three-fourths bale, and peanuts 50 to 80 bushels. Soybeans return heavy yields, but they are usually left in the fields for hogs. Much of the peanut acreage also is "hogged off." The same mixtures and quantities of fertilizer are used on this soil as on Dunbar fine sandy loam. This soil does not drain so readily nor warm up so quickly as Dunbar fine sandy loam. It can be built up to a fair state of productivity through the incorporation of organic matter and the application of liberal quantities of lime.

Onslow fine sandy loam.—Onslow fine sandy loam in forested areas is characterized by a 2- to 4-inch dark-gray surface layer, a 1- to 3-inch light-gray subsurface layer, and a 1- to 5-inch coffee-brown layer of hard material containing streaks and specks of lighter colored material. Below the hardpan layer the material is pale-yellow loamy fine sand which extends to a depth ranging from 14 to 18 inches. The true subsoil is drab-yellow sticky fine sandy clay or clay. In cultivated fields the surface soil is gray or brownish-gray loamy fine sand or fine sandy loam to the depth of plowing, which in most places extends below the brown indurated layer. This hard layer is broken into small yellowish-brown aggregates, ranging in size from one-eighth inch to 2 inches in diameter, scattered over the surface and intermingled with the surface soil. In places the hardpan layer loses its identity after the soil has been cultivated for a long time. Many areas mapped as Norfolk and Dunbar soils had this brown indurated layer before cultivation. The subsoil is underlain by dull yellowish-gray heavy material mottled with light brown.

Onslow fine sandy loam is not uniformly developed. In some wooded areas the brown layer is absent, and in some places in the fields no concretions occur, but these spots are not large and otherwise are similar to the Onslow soil. Natural drainage on this soil is not so good as on Norfolk fine sandy loam but is somewhat better than on some areas of the Dunbar soils. The land ranges from level to gently rolling, and in places open ditches are necessary for adequate drainage.

Onslow fine sandy loam is the largest semiwell-drained soil in the county. It has a total area of 41.5 square miles. It occurs throughout all the well-drained sections, the largest bodies lying in a belt across the central part of the county from Grissett Town in the southwestern part to Lanvale in the northeastern part. A few small areas are in other parts.

This is considered a fair soil, but only about 10 percent of it is in cultivation. About 40 percent of the cultivated land is devoted to corn, 15 percent to tobacco, 20 percent to sweetpotatoes, 10 percent to cotton, 10 percent to peanuts, and 5 percent to potatoes and garden vegetables. Corn yields from 15 to 25 bushels an acre, tobacco 800 to 1,200 pounds, sweetpotatoes 60 to 250 bushels, cotton one-fourth to three-fourths bale, and peanuts 35 to 75 bushels. The fertilizer treatment is essentially the same as that for Norfolk fine sandy loam and Dunbar fine sandy loam.

DARK-COLORED POORLY DRAINED FINE SANDY LOAMS AND LOAMS

The group of dark-colored poorly drained soils includes Bladen loam, Coxville fine sandy loam, Coxville loam, Plummer fine sandy loam, Ochlockonee loam, Congaree silt loam, and Myatt fine sandy loam. These soils occupy 133.4 square miles, or 15.5 percent of the total area of the county. Bladen loam, Coxville fine sandy loam, Coxville loam, and Plummer fine sandy loam are upland soils, Ochlockonee loam and Congaree silt loam are developed on the first bottoms, and Myatt fine sandy loam occurs on the low second bottoms, or terraces. The upland soils occupy almost level areas and have not been invaded in many places by natural drainageways. The surface maintains the original constructional form, for the most part, as when the material was lifted from the ocean. All the soils in this group are naturally poorly drained, and Ochlockonee loam and Congaree silt loam are subject to frequent and sometimes long-continued overflows.

Most of these soils range from dark gray to grayish brown and are intermediate in color between the light-colored soils of the first group and the black soils of the third group. They contain more organic matter than the light-colored well-drained soils and are strongly acid in reaction. With the exception of Plummer fine sandy loam, all the soils in this group are heavier in texture, both in the surface soil and subsoil, than the soils of the first group. The subsoils are dominantly mottled, which feature indicates poor drainage and incomplete aeration and oxidation.

The tree growth consists of sweetgum, black gum, cypress, maple, shortleaf pine, and longleaf pine, with an undergrowth in some places of baybushes, gallberry bushes, and bamboo briers (greenbrier.) Practically all the growth on the Plummer soils is longleaf pine, together with some black gum.

These soils, with the exception of Plummer fine sandy loam and Myatt fine sandy loam, are inherently good and could be farmed if they were artificially drained. Bladen loam, Coxville fine sandy loam, and Coxville loam can be drained satisfactorily by canals supplemented by open ditches. The open ditches are lasting and serviceable in these soils, as the walls stand up exceptionally well because of the heavy texture and structure of the subsoils. Water does not penetrate these soils so readily as it does the light-textured fine sandy loams, and drainage for the most part must be from the surface. The Plummer and Myatt soils offer more difficulty as regards drainage, because the ditches are subject to frequent filling by fine sand sloughing in from the sides.

With the exception of Coxville fine sandy loam, Coxville loam, and a small part of Bladen loam, none of the land is cleared or cultivated. More of the Bladen soil was formerly farmed than at present. The Bladen soils, from Florida to North Carolina, are used for the production of potatoes. Soybeans and corn are produced on them in North Carolina. The Coxville soils when drained are well suited to the production of strawberries, soybeans, cabbage, and late truck crops. Congaree silt loam and Ochlockonee loam would produce large yields of corn and hay if they were drained and reclaimed.

Bladen loam.—The surface soil of Bladen loam consists of an 8- or 10-inch layer of dark-gray or grayish-brown loam which in some places is nearly black when moist but dries to a grayish-brown color. The dark color is due to the high organic-matter content. In most places the upper part of the subsoil is drab-gray or yellowish-gray clay loam or clay, streaked with rust brown. The subsoil proper, beginning at a depth ranging from 12 to 18 inches, is steel-gray heavy plastic clay, mottled or streaked with rust brown or ocher yellow. The material in this layer is very plastic, and the gray color becomes more pronounced with depth.

Included with Bladen loam in mapping are a few areas of Bladen fine sandy loam which differs from the loam in having a fine sandy loam surface soil, but the subsoil is practically identical with that of the loam. The largest areas of this kind lie 1 mile southwest of Winnabow and 2 and 5 miles east of Grissett Town. These included areas have about the same relief and drainage conditions as Bladen loam. Only a few spots are under cultivation, and the crop yields are practically the same as on the loam soil.

Bladen loam covers a total area of 41.4 square miles. It occupies several rather large areas fairly well scattered throughout the county. The largest bodies are south of North West, east of Bolivia, 3 miles southwest of Supply, south of Camp Branch Church, south of Longwood, south and west of Makatoka, and at other places in the western part of the county. The land is flat, and much of it is in a semi-swampy poorly drained condition. Much of it, however, could be successfully drained by canals and lateral ditches.

Although this soil has a rather large total acreage, only a very small proportion of it is cultivated, and the rest is used in part for pasture and for the growth of timber. A few small areas which have been artificially drained are devoted to the production of corn, oats, hay, and soybeans. In some areas covered by second-growth forest, the ridges of former corn rows may still be seen, indicating that this land was cultivated many years ago; in fact, some of the land was drained and cultivated prior to the Civil War, and it is stated that high yields of corn, cotton, and potatoes were obtained. Corn yields from 30 to 50 bushels an acre and is fertilized with a 3–8–3 mixture applied at a rate ranging from 300 to 400 pounds an acre. Soybeans are well suited to this soil, and oats do fairly well. Inherently this is one of the best upland soils in the county, and where thoroughly drained, and limed sufficiently to correct the strongly acid condition, it will produce good yields of corn, soybeans, and hay. Potatoes also do well. The soil offers possibilities for future development.

Coxville loam.—Coxville loam in a virgin condition covered by native grass is gray or dark-gray loam to a depth of 4 or 6 inches. It is underlain by gray heavy fine sandy loam mottled with yellow, and this material, at a depth ranging from 9 to 12 inches, passes into the upper subsoil layer of mottled yellow and gray heavy fine sandy clay which contains a few red splotches in the lower part. This material, in turn, at a depth ranging from 18 to 22 inches, passes into the lower subsoil layer consisting of gray and yellow mottled heavy somewhat tough clay splotched with bright red. At a depth of about

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34 inches the red color in most places becomes more pronounced but fades out at a depth between 4 and 5 feet. Included with this soil as mapped are spots of Coxville very fine sandy loam, Coxville silt loam, Plummer fine sandy loam, and Bladen loam. The largest areas of Coxville silt loam are about 2 miles northeast of Hickmans Crossroads, and a small area is about 2 miles northwest of Phoenix. Coxville silt loam differs from Coxville loam only in texture of the surface soil, which is silt loam, and in its slightly heavier subsoil.

Coxville loam is one of the most extensive soils in the group of dark-colored poorly drained soils. It occurs as flat areas scattered throughout the greater part of the county. The largest bodies are west of Winnabow, west, north, and east of Bolivia, near Longwood, northwest of Makatoka, and west of Waccamaw School. Some of the land is so flat that water stands on the surface during several months of each year. Most of this soil in its present poorly drained condition is not suited to agriculture, but along the boundary between this and the Dunbar soils, some of the Coxville soil has been drained and cultivated. The principal crops are corn, soybeans, cotton, peanuts, and oats. The same kinds and quantities of fertilizers are used as on the adjoining Dunbar soils. With a thorough drainage system of open ditches this soil should give satisfactory yields of peanuts, soybeans, and corn.

Coxville fine sandy loam.—The surface soil of Coxville fine sandy loam consists of dark-gray or brownish-gray fine sandy loam ranging in thickness from 6 to 10 inches. The subsoil begins as mottled yellow and gray rather heavy fine sandy clay which passes into mottled yellow and gray heavy sticky fine sandy clay or clay, showing splotches or streaks of bright red. In places the subsoil is heavy plastic clay which continues to a depth of 3 feet or deeper.

The relief is level, and drainage is poor. This soil covers an area of 10.7 square miles and is rather widely scattered over the central and western parts of the county. The largest bodies are north of North West, south of Shiloh Church, at and south of Camp Branch Church, near Waccamaw School, and near and northeast of Longwood.

On account of poor drainage, Coxville fine sandy loam is not farmed except in small areas in conjunction with the Dunbar soils. This soil around Chadbourn in Columbus County is devoted extensively to strawberries [3] which produce yields of more than 9,000 quarts an acre. This soil, by ditching, liming, and deeper plowing, can be made productive and will produce good yields of corn, soybeans, peanuts, strawberries, and other crops. The yields on the small acreage of this land under cultivation are about the same as those on Dunbar fine sandy loam, as the same crops are grown on the two soils and they receive the same fertilizer treatment.

Plummer fine sandy loam.—The 6- to 15-inch surface soil of Plummer fine sandy loam is gray fine sandy loam or loamy fine sand. The topmost 2- or 3-inch layer in wooded areas is dark gray or nearly black, owing to the presence of organic matter. The subsoil is light-gray, slightly mottled with yellow, friable fine sandy clay. In places where this soil grades into Portsmouth fine sandy loam, the

[3] LINEBERRY, R. A., SKINNER, J. J., MANN, H. B., and WILLIAMS, C. B. RESULTS OF STRAWBERRY FERTILIZER AND TILLAGE EXPERIMENTS. N. C. Agr. Col. Agron. Inform. Circ. 64, 16 pp., illus. 1931. [Mimeographed.]

surface soil is dark-gray fine sandy loam to a depth ranging from 6 to 9 inches, and the subsoil is in general very friable. In such places ditch walls cave in quickly, making drainage difficult. In this county, however, where this soil is associated with the Coxville and Bladen soils, the subsoil is heavier than typical. Included with the Plummer soil as mapped are many areas of Portsmouth fine sandy loam, Plummer fine sand, and Coxville fine sandy loam, which are too small and intricately mixed to be separated on a small-scale map.

Plummer fine sandy loam is developed in all parts of the county. Large areas occur on both sides of Green and Little Green Swamps from Longwood to North West, and smaller areas are south of Bolivia and in the western part. Most of this soil, like Portsmouth fine sandy loam, occurs in flat interstream areas where the natural drainageways are poorly defined, and some of it lies at the heads of small drainageways. Drainage is everywhere inadequate. The greater part of the land has been cut over, but some of it supports a fair growth of longleaf pine. Black gum is a characteristic tree in many places.

Plummer fine sandy loam occupies a total area of 38.3 square miles, but only a very small part of it has been reclaimed and used for farming, and crop yields are low. Areas in which the subsoil contains enough clay that the walls of ditches stand up, when drained and properly handled will give fair yields of strawberries, broccoli, turnips, carrots, spinach, and other late vegetables. The best use for Plummer fine sandy loam is for pasture and forestry.

Myatt fine sandy loam.—Myatt fine sandy loam is not typically developed in Brunswick County, as neither the surface soil nor the subsoil is uniform in color, texture, or structure. The color of the surface soil ranges from gray to dark-gray and brown fine sandy loam or clay loam, and of the subsoil from gray to light-gray or yellowish-gray fine sandy clay or clay, with faint mottling of yellow and brown. In a few places the lower part of the subsoil shows red mottling.

Spots of soil with a gray or brownish-gray surface soil and yellow or yellow mottled with gray subsoil are included with this soil in mapping. These areas would have been mapped as Kalmia fine sandy loam had they been large enough to warrant separation. A few areas of Leaf fine sandy loam are also included. The Leaf soil differs from the Myatt soil in that the subsoil is bluish-gray tough plastic clay mottled with bright red. The Kalmia and Leaf soils are developed on the second bottoms, or terraces, and occupy slightly higher positions than the Myatt soils.

Myatt fine sandy loam is subject to frequent overflow, and none of it is under cultivation. The best use for this soil is for pasture and forestry.

Ochlockonee loam.—The 8- or 10-inch surface soil of Ochlockonee loam consists of grayish-brown or dark-brown loam or silt loam, which gradually passes into grayish-brown or mottled light-gray and rust-brown sticky clay extending to a depth of 40 or more inches. This soil varies considerably in color and texture. In many places the surface soil, to a depth ranging from 6 to 10 inches, is dark-gray medium sandy loam or fine sandy loam underlain

by gray and drab fine sandy clay containing yellow or brown mottlings. In places the surface soil is silt loam, and in other places it consists of an 8- to 15-inch layer of muck. Along a few streams, strips of dark-gray or nearly black clay loam are included, and in other places, strips of swamp and meadow.

Ochlockonee loam occurs as first-bottom land along a number of streams. It consists of alluvial material washed from the soils in the coastal-plain region, brought down and deposited by the streams. The largest areas are along Waccamaw River, Shingletree Swamp, Lewis Swamp, Town Creek, Hood Creek, and some other streams. The relief is flat. A large part of the land is covered with water for long periods and is overflowed by every freshet. None of the land is cultivated, but some is used for pasture. Most of this land, if drained, would produce good yields of corn, oats, and soybeans and would support a good cover of pasture grasses. Under present conditions its best use is for forestry.

Congaree silt loam.—Congaree silt loam occurs only in the northern end of the county as first-bottom land along Cape Fear River, extending from the Columbus County line to the mouth of Indian Creek 2 miles north of Navassa.

The 8- to 15-inch surface soil ranges from dark-brown to light-brown silt loam. This material grades into a heavy silty clay or clay subsoil which is slightly lighter in color than the surface soil and extends to a depth ranging from 5 to more than 8 feet. In most places, below a depth ranging from 30 to 36 inches, the subsoil is mottled with rust brown and gray.

Mapped with Congaree silt loam along the banks of Cape Fear River are narrow strips which consist of light-brown fine sandy loam or fine sand. Such spots lie higher than the areas of typical Congaree silt loam and occupy a leveelike position.

Owing to its low position, Congaree silt loam is frequently covered by water from overflows of Cape Fear River, and during extremely high water it may be inundated to a depth of several feet.

The materials composing this soil have been washed from the soils of the piedmont plateau, together with an admixture of material washed from the soils of the Atlantic Coastal Plain and brought down and deposited by Cape Fear River. This is inherently one of the best soils in Brunswick County and in the State of North Carolina, as it contains a fair amount of plant nutrients including nitrogen, phosphorus, and potash. None of the land is under cultivation, but some of it is used for grazing during the summer and fall. Under present drainage conditions, the best use of this soil is for pasture and forestry. If it were drained and reclaimed, it would be valuable for the production of corn and hay, as it would probably produce from 30 to 60 bushels of corn an acre without fertilization.

BLACK LOAMS AND FINE SANDY LOAMS

The group of black loams and fine sandy loams includes Portsmouth fine sandy loam, Portsmouth loam, Hyde loam, and Johnston loam. The soils of this group are well distributed over all parts of the county, predominantly in the western part. They occupy a total area of 99.1 square miles, or 11.6 percent of the area of the county. These soils are easily distinguished from the soils of the first two

groups by their black color and high content of organic matter. In some places the surface soils contain enough organic matter to give them a mucky feel. These soils are very strongly acid and would require heavy applications of lime to neutralize their acidity.

Soils of this group, with the exception of Johnston loam, occupy flat areas or slight depressions, and they are all naturally poorly drained. Some areas of Hyde loam, Portsmouth loam, and Portsmouth fine sandy loam have been drained by canals and open ditches, and a few areas are cultivated. The forest growth is dominantly sweetgum, black gum, maple, and cypress, and there is a dense undergrowth of baybushes, gallberry bushes, and briers.

All these soils, if drained and limed, would produce good yields of corn, soybeans, cabbage, potatoes, onions, and late truck crops. Hyde loam is rightly considered an excellent agricultural soil after it has been sufficiently drained. In Hyde County, N. C., it is the leading soil for the production of corn and soybeans.

Portsmouth fine sandy loam.—The surface soil of Portsmouth fine sandy loam consists of a 10- to 15-inch layer of very dark gray or black fine sandy loam high in organic matter. It is underlain by gray or light-gray, mottled with yellow, friable fine sandy clay which extends to a depth of 40 or more inches, where it grades into steel-gray very friable fine sandy clay or loamy fine sand. In most places the first few inches of the subsoil consist of light-gray heavy fine sandy loam, but in a few places the material is rather heavy sticky fine sandy clay.

This soil occupies level areas or slight depressions and is very poorly drained. It covers a total area of 52.2 square miles. Fair-sized bodies are widely scattered over the county, the largest of which are in the northern part north of Winnabow and in the western part north and south of Longwood. Only a small proportion of this soil is in cultivation, as practically all of it is used for pasture or supports a forest growth. Many level areas support a scattered growth of longleaf and shortleaf pines and an undergrowth, mostly of sedges, ram's-horn, grasses, pitcherplant, and Venus's flytrap, and the bay areas have a rather thick growth of bay and pond pine, with an undergrowth of baybushes, briers, gallberry, and huckleberry.

In places where this soil has been drained and limed, corn and soybeans are the principal crops. Corn yields from 15 to 30 bushels an acre without fertilizer. In New Hanover, Pender, and Columbus Counties, this soil is used for the production of lettuce, beets, cabbage, onions, carrots, strawberries, potatoes, broccoli, and similar crops. Heavy applications of commercial fertilizers are used on all truck crops. This soil offers possibilities for agricultural use.

Portsmouth loam.—To a depth ranging from 8 to 14 inches, Portsmouth loam consists of very dark gray or black loam, heavy fine sandy loam, or mucky loam, containing a large amount of organic matter. This layer is underlain by gray or dark-gray loam or fine sandy clay loam, extending to a depth of 20 inches. The subsoil is gray or bluish-gray heavy sticky, though friable, fine sandy clay or clay, faintly mottled with yellowish brown. This soil as mapped includes small areas of Portsmouth fine sandy loam and areas which are more or less mucky on the surface.

Portsmouth loam comprises a total area of 36.7 square miles, and the areas are scattered throughout the greater part of the county. The largest body is in Little Green Swamp, extending from near North West almost to Bolivia and including about 20 square miles. Fair-sized areas are east of Camp Branch Church, east of Waccamaw School and northeast of Seaside, and smaller bodies occur elsewhere.

Portsmouth loam occurs in depressions, bays, swamps, and ponds. The relief is flat, and natural drainage is very poor. In places, fair drainage has been established by open ditches and canals. Practically all of this land is forested or burned-over land, and only a few acres are in cultivation. If drained and reclaimed this soil will produce good yields of corn, potatoes, cabbage, and celery. It is naturally a strong soil for the production of corn and soybeans and should give good yields with proper fertilization. Lime should be added for best results.

Hyde loam.—The surface soil of Hyde loam consists of black loam, silty loam, or mucky loam, ranging in thickness from 15 to 40 inches. This is underlain by bluish-drab clay, sandy clay, or sticky silty clay. In a few places the black mucky loam either extends to a depth of 3 feet or is underlain at a depth of about 30 inches by bluish-drab or brownish-drab clay. This soil is closely associated with Pamlico muck and areas of Portsmouth soil, and it includes small bodies of each. It also includes a few areas of black clay loam and silt loam, too small to separate on the map.

Hyde loam is developed in small widely separated areas in the central and western parts of the county. The largest bodies are northwest of Funston, south of Mill Creek Church, northwest of Bolivia, north of Camp Branch Church, northeast of Freeland, and southwest of Grissett Town.

This soil occupies depressions, or "bays", some of which resemble old lake basins. The relief is flat, and natural drainage is poor. In most places the water table is within 3 feet of the surface, and frequently the ground is saturated to the surface. Some of the land has been drained by open ditches and canals, but the areas are so widely separated that it would be too expensive to drain them all. Probably 6 percent of the land has been cleared, but only about 4 percent is now under cultivation. Corn, soybeans, and hay are the principal crops, and some vegetables, pumpkins, and a little ribbon cane are grown.

This soil is naturally strong and productive, and when first cleared it produces from 40 to 60 bushels of corn an acre without the aid of fertilizer. Some of the land seems to have been farmed for several years and then abandoned, owing, probably, to the fact that the ditches were not kept cleared or that crop yields decreased to the point where it was not profitable to continue farming. An application of 400 pounds of superphosphate is used for corn, and where this soil is limed and fertilized properly, large yields of corn and soybeans can be produced.

Johnston loam.—The surface soil of Johnston loam is dark-gray or black loam, heavy loam, or silt loam, to a depth ranging from 12 to 24 inches. It is underlain by dull-gray or bluish-gray, mottled with brown, gray, and yellow, rather heavy fine sandy clay or sticky silty clay. In most places where this soil adjoins the upland some

fine sand or medium sand has washed on the surface. In a few places the surface layer is mucky and continues downward to a depth of 3 feet or deeper. The soil, as a whole, has a high content of organic matter.

This soil occupies the first bottoms of streams and it is all subject to frequent overflows. The subsoil is saturated with water throughout the year, and in places the surface is covered with water during the greater part of the year. Small spots along Saucepan Creek, Ox Pen Branch, and Sharron Branch are cultivated. The land is used almost entirely for corn which yields from 20 to 40 bushels an acre. If the land were cleared and the stream channels deepened to prevent frequent overflows, this soil would be valuable for the production of oats, soybeans, cabbage, and pasture grasses.

WELL-DRAINED AND POORLY DRAINED FINE SANDS

The group of well-drained and poorly drained fine sands comprises all the fine sands, one type of loamy fine sand, and one type of sand. The group is divided into subgroups of well-drained soils and poorly drained soils.

The subgroup of well-drained sands includes Norfolk fine sand, Norfolk sand, Ruston fine sand, Onslow loamy fine sand, Blanton fine sand, St. Lucie fine sand, St. Lucie fine sand, brown-substratum phase, and Leon fine sand. All these soils are light colored, open, porous, and exceedingly well drained, except Onslow loamy fine sand which has a slightly darker surface soil and is not quite so well drained as the other members of the subgroup. All these soils have level or gently rolling relief. With the exception of parts of Norfolk fine sand, Norfolk sand, Ruston fine sand, and Onslow loamy fine sand, practically none of the land is cleared or cultivated, as all these sands are inherently low in plant nutrients. St. Lucie fine sand, St. Lucie fine sand, brown-substratum phase, and Leon fine sand are inherently the poorest and least desirable soils in this subgroup.

The subgroup of poorly drained sands includes Plummer fine sand, Portsmouth fine sand, Portsmouth fine sand, mucky phase, and St. Johns fine sand. Plummer fine sand contains a small amount of organic matter, but Portsmouth fine sand and St. Johns fine sand contain a large amount in the 6- to 15-inch surface layer. All these sands are poorly drained, and the water table, under normal conditions, in most places is within 3 feet of the surface. These soils are developed mainly in flat areas and, in some places, in slight depressions. Drainage of these fine sands is difficult, because ditches fill with the fine sand running in from the sides. Under present economic conditions the only use for these poorly drained soils is forestry.

Norfolk fine sand.—Norfolk fine sand occurs in several long comparatively narrow areas in the southern part of the county where it borders areas of tidal marsh. Some of the largest bodies are in the vicinity of Calabash on Colkins Neck, around Seaside, east and west of Long Point, and between Long Point and Southport. A few small strips occur in the eastern part of the county along Cape Fear River.

The 4- to 6-inch surface layer of Norfolk fine sand consists of light-brown or brownish-yellow fine sand. It grades into brownish-yellow

fine sand or slightly loamy fine sand, and this, at a depth ranging from 10 to 15 inches, grades into yellow or pale-yellow loose fine sand which continues to a depth of 40 or more inches. In most places below a depth of 40 inches the sand is pale yellow or grayish yellow. On a few of the knolls and ridges the sand is light brown or light gray and is underlain by loose rather incoherent fine sand. Where this soil grades into St. Lucie fine sand, a slightly brown stained layer occurs in some places at a depth ranging from 12 to 15 inches.

The relief of Norfolk fine sand ranges from almost level to gently sloping. This soil is everywhere excellently drained because of its position and because of its open porous structure which allows rain water to penetrate very easily. As the land dries quickly, farming operations can be carried on almost immediately after rains.

Probably one-half of this soil is under cultivation and is used mainly for the production of corn, peanuts, watermelons, and garden vegetables. Yields are low unless the land is heavily manured or given a heavy application of commercial fertilizer. In some places along the coast, oystershells and some fish scrap have been applied to the soil, and wherever these soil amendments have been added, increased yields result. Many of the fishermen and oystermen live on land of this kind, and they use small plots of it for growing garden vegetables and corn.

Norfolk sand.—Norfolk sand occupies only a small total area. It occurs in five fair-sized bodies in the extreme northern end near Cape Fear River, where it borders areas of Congaree silt loam. The relief is undulating, and the land is everywhere well drained.

Norfolk sand, to a depth of 4 or 6 inches, is light-brown or grayish-brown sand. This is underlain by yellow or slightly brownish yellow sand which extends to a depth ranging from 4 to 5 feet. This soil is rather loose and porous, and the organic matter and plant nutrients readily leach out of it.

A small acreage is used for the production of some early truck crops, cowpeas, corn, and watermelons. These crops, especially the truck crops and watermelons, are heavily fertilized. Watermelons do well when manure is placed in the hills and when a heavy application of fertilizer is made. This soil is inherently low in plant nutrients, and, because of its porous structure and leachy character, it cannot be built up or maintained in a high state of productivity. Its best use is for forestry.

Ruston fine sand.—The 6- to 9-inch surface layer of Ruston fine sand is brown or yellowish-brown fine sand. It is underlain by reddish-yellow, yellowish-red, or yellowish-brown fine sand which changes to orange-colored loose rather incoherent fine sand at a depth ranging from 34 to 40 inches.

This soil is inextensive, and practically all of it is on Oak Island, southwest of Southport, and in a narrow strip bordering the marsh north of Holden Beach. The relief is gently rolling, and the land is exceptionally well drained.

Only a small acreage is farmed, and yields are low except where the land is very heavily fertilized. This is a soil of low productivity, but it can be used for the production of early truck crops, watermelons, and scuppernong grapes. It is fertilized and culti-

vated in about the same way as Norfolk fine sand and has about the same agricultural value.

Onslow loamy fine sand.—Onslow loamy fine sand, like Onslow fine sandy loam, is characterized by a brown hard layer of sand cemented with organic matter or a brown soft layer at a depth of a few inches. The texture is loamy fine sand to a depth of more than 3 feet in places where the sand is underlain by yellow, grayish-yellow, or mottled yellow and gray fine sandy clay. This soil is very variable in color. The surface soil in some places is dark gray, and in other places it is light gray or grayish yellow. As mapped this soil includes spots of Onslow fine sandy loam and of Norfolk fine sand.

The relief of Onslow loamy fine sand ranges from undulating to gently rolling, and drainage is good, except in slight depressions between some of the gently rolling areas where the soil is darker and drainage is not well established.

This soil covers a total area of 14.7 square miles, and the bodies are scattered over the well-drained parts of the county. Some of the largest bodies are northwest of Longwood, south of Mocco, and south of Supply. A number of smaller areas are in various parts of the county.

Only a very small acreage of this soil has been cleared and placed under cultivation. The land supports a growth of shortleaf and longleaf pines and small hardwoods. This is a soil of low agricultural value, and yields of all crops are low, except when the land is very heavily fertilized or manured. The best use of this land is for forestry.

Blanton fine sand.—Blanton fine sand consists of light-gray or yellowish-gray fine sand to a depth of 5 or 7 inches, where it passes into pale-yellow or light cream-colored loose and somewhat incoherent fine sand which extends to a depth ranging from 4 to more than 5 feet. In an exposed cut, this fine sand shows some very light gray or almost white splotches. Much of this soil in Brunswick County has a brown-stained layer of fine sand at a depth ranging from 3 to 6 inches, which may range from 1 to 6 inches in thickness. Locally this brown-stained layer has hardened into slightly compact material or a semisoft crust. Where Blanton fine sand adjoins areas of Ruston fine sandy loam, deep phase, reddish-brown or reddish-yellow friable fine sandy clay is present at a depth ranging from 4 to 6 feet, and where it adjoins St. Lucie fine sand, the entire profile is lighter in color.

Blanton fine sand covers a total area of 68 square miles. It occupies the higher and better drained parts of the county, and the relief ranges from almost level to gently rolling. Owing to its relief and to the loose porous character of the sand, drainage is rapid and thorough. The largest bodies lie between Southport and Wilmington, north of Mocco, and northwest and southeast of Supply. Many small areas are in the vicinity of Shallotte.

The greater part of this soil supports a scattered growth of turkey oak, other small oaks, and a few longleaf pines. Longleaf pine was the principal original growth on this land. Practically all the merchantable timber has been cut, except on some of the larger tracts and where the trees are boxed for turpentine.

A few small areas of Blanton fine sand are under cultivation and are used for the production of sweetpotatoes, corn, and garden vegetables for home consumption. This soil requires heavy fertilization in order to produce even ordinary yields, and it would be difficult to bring the land to a fair state of productivity or to maintain it in that condition. Under present conditions it is best suited for forestry.

Leon fine sand.—To a depth ranging from 3 to 5 inches Leon fine sand is light-gray or dark-gray fine sand. Its moderately dark color is due to the presence of some organic matter. This sand grades into very light gray or nearly white loose fine sand which is underlain, at a depth between 9 and 24 inches, by a coffee-brown or almost black compact layer or hardpan (locally known as sand rock) composed of fine sand cemented by organic matter. This hardpan layer ranges from 4 to 20 inches in thickness and is underlain by brownish-gray, changing to light-gray or almost white, fine sand. In many places the material below the hardpan grades into lighter brown and then into nearly white fine sand which in most places is saturated with water.

In some places where drainage is not good and where this soil occurs in close proximity to St. Johns fine sand, the surface soil contains a noticeable amount of organic matter. Included with this soil as mapped are some areas of Blanton fine sand, Plummer fine sand, and St. Lucie fine sand. In the northern part of the county a few small areas of Leon sand are included, which differ essentially from Leon fine sand in that the sand is coarser in texture. The few areas of Leon sand occur northwest of Navassa and north and east of Phoenix. The relief, drainage, and forest growth are the same as those of Leon fine sand. Small areas of the sand have been cleared for farming, but crop yields are very low.

Leon fine sand occurs throughout the greater part of the county. It is the most extensive soil and covers a total area of 77.4 square miles. The largest areas are mapped north and south of Orton Pond, south of McIlhenneys Pond, northeast of Supply, and north of Shallotte. Numerous small bodies occur in a belt extending across the southern part of the county a few miles from the coast. This soil occupies broad level areas, low nearly level ridges, and, in places, gentle slopes along drainage courses. In places small cypress ponds occur. The land is medium well drained, the drainage in some places being good and in other places poor but better than that of the adjoining Plummer soils.

The original and present characteristic tree growth consists of longleaf pine, and the undergrowth is wire grass. In places the land supports some scrub oaks, and, where it joins the St. Johns, Plummer, or Portsmouth soils, some gallberry bushes grow. Only a small acreage of Leon fine sand has been cleared for farming. Practically all the land is in forest or provides some scant pasture. The farmed land returns extremely low crop yields. The hardpan layer must be broken up before any crops can be grown. The entire soil mass, particularly the hardpan layer, is strongly acid. The best use for Leon fine sand is forestry.

St. Lucie fine sand.—St. Lucie fine sand consists of white fine sand to a depth ranging from 3 to more than 4 feet. It is very loose and incoherent throughout and contains practically none of the mineral

plant nutrients, but the topmost 2- or 3-inch layer contains a sprinkling of loose organic matter. In many bare places the surface soil has the appearance of snow. In places where this sand adjoins Portsmouth fine sand or some other poorly drained fine sand, a slightly brown stained layer occurs at a depth ranging from 10 to 15 inches below the surface.

St. Lucie fine sand comprises only a small total area. It occurs in several small bodies in the southern part of the county, the largest lying northwest of Holden Beach and northeast of the mouth of Lockwood Folly River.

This soil is developed on low ridges and slight elevations or as low wind-blown dunes or low knobs near small ponds and lakes. It is closely associated with Portsmouth, Blanton, and Leon fine sands. The ridgelike areas are exceptionally well drained, but in the almost level areas the water table is nearer the surface. In the slight depressions, a small quantity of organic matter is present in the topmost few inches of the surface soil. None of the land is under cultivation. It supports a scattered growth of longleaf pine, together with some second-growth scrub oak or turkey oak, and along the boundaries between this soil and Portsmouth fine sand, some gallberry bushes and clumps of wire grass grow.

This soil is inherently unproductive and is considered practically worthless for agriculture. The only known use of it is for forestry.

St. Lucie fine sand, brown-substratum phase.—St. Lucie fine sand, brown-substratum phase, differs from typical St. Lucie fine sand in that a layer of fine sand stained with brown or grayish brown occurs at a depth ranging from 20 to 34 inches. This stained layer ranges in thickness from 3 to 10 inches, and below it is white or light-gray fine sand. Soil of this phase occurs in close association with typical St. Lucie fine sand and Blanton fine sand. The relief ranges from undulating to almost level.

None of the land of this phase has been cleared. Its best use is for forestry. The tree growth consists of scrub oaks, together with a few scattered pines.

Plummer fine sand.—Plummer fine sand, to a depth of 3 or 5 inches, is dark-gray loamy fine sand carrying a noticeable amount of organic matter. This is underlain by light-gray or grayish-white fine sand which extends to a depth of more than 3 feet. In places it is slightly mottled with yellow or rust brown. This fine sand in most places is saturated with water during the greater part of the year and in some places is somewhat like quicksand. When wet it will readily run off the grooves of a soil auger.

None of this soil is used for the production of farm crops, and none of it has been cleared, but some is used for pasture, as wild grasses do well because of the good moisture conditions. The land is forested to longleaf and loblolly pines, with an undergrowth of baybushes and gallberry bushes.

The largest areas lie 6 miles south of Bolivia, north of Mary Inlet, and 1 mile north of Grissett Town, and a number of small bodies are scattered over the southeastern part of the county.

This land is naturally poorly drained, and drainage would be difficult to establish because the ditches would quickly fill with fine sand. The best use of Plummer fine sand is for forestry.

Portsmouth fine sand.—The surface soil of Portsmouth fine sand consists of dark-gray or black loamy fine sand or slightly mucky fine sand, ranging from 8 to 15 inches in thickness and containing a large amount of organic matter. This is underlain by almost white, light-gray, or brown fine sand to a depth of 3 feet or deeper. In places a brown feebly cemented layer occurs at a depth ranging from 20 to 28 inches. In some places the soil material is dark-gray fine sandy loam to a depth of more than 3 feet. The surface layer is mucky in places, and spots of Portsmouth fine sand, mucky phase, are included in mapping. Areas associated with the Plummer soils and marginal areas to the Blanton soils have only about a 5-inch layer of black surface soil underlain by white fine sand.

Areas of Portsmouth fine sand are mapped in all parts of the county, the largest occurring north of Phoenix, 2 miles east of Shiloh Church, south and east of Funston, north of Supply, between Supply and Southport, 1 mile north of Shallotte, north of Longwood, and south of Grissett Town. There are many smaller bodies throughout the county.

All this soil occurs in depressions or bays, and natural drainage is extremely poor. None of the land has been reclaimed for farming. The original tree growth consisted almost entirely of pond pine (locally called red-heart pine), but most of these pines have been killed by forest fires. Baybushes and bamboo briers constitute the principal undergrowth. This soil is used only for forestry, but the trees make a poor grade of lumber.

Portsmouth fine sand, mucky phase.—Portsmouth fine sand, mucky phase, differs from the typical soil mainly in that the 10- to 20-inch surface layer is mucky fine sand or wet mucky material, very high in organic matter. The underlying material is similar to that underlying the typical soil. In some places peaty material several inches thick overlies the light-colored fine sand.

This soil occupies bays, depressions, and pondlike areas where drainage is very poor and water stands on the surface the greater part of the year, except during very dry periods, such as the fall of 1931, when the surface layer in places burned to a depth ranging from 6 to 10 inches. None of the land is cleared, and the forest growth is similar to that on the typical soil. In its present condition the land has a very low value even for growing trees.

The largest areas of this soil occur southwest of Pretty Pond, south of Orton Pond, south of Shiloh Church, west of Winnabow, and southwest of Grissett Town.

St. Johns fine sand.—The surface soil of St. Johns fine sand is very dark gray or black fine sand to a depth ranging from 6 to 14 inches. It has a high content of organic matter, the topmost few inches being composed of partly decomposed roots, leaves, and twigs. The subsurface layer is light-gray loose incoherent fine sand ranging from 4 to 8 inches in thickness. This is underlain by a dark-brown or nearly black hardpan layer composed of fine sand cemented together by organic matter and ranging in thickness from 6 to 24 inches. The hardpan layer is underlain by brownish-gray or yellowish-brown incoherent wet fine sand containing pockets of light-gray fine sand. It grades, at a depth ranging from 3 to 4 feet, into light-gray fine sand.

St. Johns fine sand covers a total area of 18.1 square miles, the greater part of which occurs in the southern part of the county, a short distance back from the coast. Many small areas are mapped in the eastern part near Cape Fear River. The largest bodies are in the southwestern part between Shallotte River and the coast. This soil occupies bays and depressions, where the relief is flat and drainage extremely poor, so that much of the land is in a semi-swampy condition much of the time. Even though it were well drained on the surface, the impervious hardpan layer would retard internal drainage.

All this land is in forest, with the exception of a few small areas used as garden spots for the production of corn and vegetables. The undergrowth in the forests consists of a rather thick growth of bay-bushes and gallberry bushes, together with many briers. The pine trees are similar to those on Portsmouth fine sand. The best use for St. Johns fine sand is for forestry.

ORGANIC SOILS AND MISCELLANEOUS LAND TYPES

Organic soils and miscellaneous land types include Pamlico muck, Pamlico muck, shallow phase, peaty muck, peat, and such miscellaneous land types as swamp, meadow, tidal marsh, coastal beach, and coastal beach, dark-colored phase. Pamlico muck, Pamlico muck, shallow phase, and peaty muck support a tree growth of cypress, pond pine, sweetgum, black gum, tupelo gum, and swamp maple, with an undergrowth of baybushes, gallberry bushes, and briers. The tree growth on peat is juniper, cypress, tupelo gum, and maple, with an undergrowth of briers. The swamp and meadow areas support a tree growth of shortleaf pine, sweetgum, black gum, tupelo gum, and swamp maple and an undergrowth of bay-bushes, gallberry bushes, briers, and water-loving grasses. On tidal marsh only marsh grasses grow. Coastal beach is barren, and no trees or grasses grow, except along the edge farthest back from the ocean, but the dark-colored phase of this soil supports a growth of live oak, cedar, yaupon, bay, and other trees, and, on Smith Island, a few palmetto trees.

None of these soils is cultivated, as all, except coastal beach, are covered by, or saturated with, water.

Pamlico muck.—Pamlico muck consists of fairly well decomposed vegetable matter containing small quantities of fine sand, very fine sand, and silt, and it is uniformly black to a depth ranging from 34 to 60 inches. The underlying material is gray sticky fine sandy clay or clay, in most places faintly mottled with yellow. In places the surface layer is black sticky fine sand, and in other places, where the areas have remained too wet to burn, it consists of brown peat to a depth of 6 or 8 inches. Along the margin between Pamlico muck and the sandy soils, the surface material contains more sand and is much shallower than in the typical areas.

Pamlico muck is not very extensive. Areas occur along the highway between Southport and Supply, 1 mile west of Grissett Town, and southeast of Phoenix. A large body borders the west side of the southern end of Green Swamp. The relief is flat. This muck occupies a slightly higher position than the peaty muck or peat areas. Natural drainage has never been established, and the mois-

ture supply of the muck areas is difficult to control. The tufts and small hummocks scattered over the surface indicate that considerable peaty material has been burned during dry periods. When this muck becomes very dry, as it did in 1931, the material will burn down to the water table, or to the point where the content of mineral matter becomes considerably greater than that of organic matter. Pamlico muck is closely associated with its shallow phase, with peaty muck, and with peat. None of the land is under cultivation. Most of it supports a tree growth of gum, maple, cypress, and a poor growth of pond pines, baybushes, and bamboo briers (greenbrier).

Neither Pamlico muck nor its shallow phase have been used satisfactorily more than a few years for any agricultural purpose in North Carolina.

Pamlico muck, shallow phase.—The 6- to 10-inch surface layer of Pamlico muck, shallow phase, consists of brown peaty material in places where the material has not been burned over recently. It is underlain by dark-brown or black muck or mucky fine sand, which extends to a depth ranging from 15 to 24 inches. This material, in turn, is underlain by gray or dark-gray sticky fine sand. In places mucky material with a slick plastic feel or mucky fine sand extends to a depth ranging from 28 to 34 inches. Soil of this phase differs from typical Pamlico muck mainly in that the surface layer of muck is shallower.

Pamlico muck, shallow phase, is closely associated with peaty muck and peat, and areas of both are included in mapped areas of this shallow muck. Two rather large bodies are mapped—one in Cawcaw Bay and the other in the northern part of Green Swamp along the Columbus County line. This land supports a forest growth similar to that on Portsmouth fine sand, mucky phase, consisting principally of pond pine and a thick undergrowth of baybushes and briers. None of the land is cleared.

Peaty muck.—Peaty muck, to a depth ranging from 8 to 20 inches, is brown peat consisting of a mass of partly decomposed fine roots, leaves, and other organic remains. The underlying material is more or less thoroughly decomposed vegetable matter mixed with a small proportion of mineral matter, which extends to a depth ranging from 3 to more than 7 feet. The color is prevailingly brown. In many places, especially where the surface material has been burned, small pieces of charcoal occur, and, at a depth ranging from 20 to 40 inches, there are pine knots and limbs of pitch pine. Except in the peaty surface layer the material is soft, smooth, and nonporous. In many places, at a depth between 2 and 3 feet, brown or black muck is present. The material underlying peaty muck consists of drab, bluish-drab, brown, or mottled yellow and gray heavy plastic clay or fine sandy clay. Along the borders of areas of this soil, the surface layer is shallower and contains more mineral matter. In this respect it approaches the characteristics of muck or black loam.

Peaty muck covers a total area of 53.3 square miles. The largest bodies lie between Southport and Bolivia and along the southeastern border of Green Swamp. The relief is uniformly flat. All the peaty muck remains in a saturated condition or is covered with water throughout the year, except during an unusually dry year. In many places no definite stream channels have been established, and water moves over the surface slowly.

The area of peaty muck between Southport and Bolivia supports a tree growth mainly of shortleaf and pond pines, whereas on the areas in Green Swamp the trees are principally cypress, gum, and maple, and there is a thick undergrowth of water-loving bushes, shrubs, and briers. None of the peaty muck has been farmed, and the value of the land for agriculture after removal of the timber would be questionable. Areas of Pamlico muck, shallow phase, peat, and Pamlico muck are included with this soil in mapping.

Peat.—The material mapped as peat consists of brown rather fibrous partly decomposed organic matter ranging from 3 to 7 feet in thickness. In places the topmost 10 or 12 inches of the material consists of partly rotted leaves, twigs, and a mass of fine roots. Underlying this layer is brown smooth soft nonfibrous peat, and this, in turn, is underlain, at a depth ranging from 18 to 24 inches, by a brown fibrous mass saturated with water. The material below a depth ranging from 3 to 7 feet in most places is black sticky finely divided organic matter which is mucky in character. Along the borders and even within the peat areas are small bodies of black well-decomposed vegetable matter, which are covered by a dense growth of water-loving grasses and reeds. These areas furnish some pasture for cattle.

Two large areas of peat are mapped, both of which are in Green Swamp, with a total area of 53.1 square miles. The peat land is saturated or covered with water during a greater part of the year. None of it is under cultivation, but it is heavily forested with juniper, cypress, tupelo gum, swamp maple, and a few pines. The best use of peat is forestry.

Swamp.—Two classes of swamp are mapped in Brunswick County. The swampland along Cape Fear River is mostly piedmont material brought down by the river, and it consists of Congaree soil mixed with a little coastal-plain material. The swamp along the other streams is coastal-plain material.

Swamp occupies the first bottoms along nearly every stream. It consists of alluvial material, and new material is constantly being added by the washing in of mineral material and by the decay of vegetable matter. The areas along Cape Fear River are subject to fresh-water tides. The topsoil is variable in texture, structure, and color. The color ranges from gray or dark gray to brown or black, and the texture from fine sand to silty clay. This layer is underlain by dingy-blue, or mottled gray, yellow, and brown, fine sandy clay, heavy sandy clay, or silty clay. All swamp areas are covered with water the greater part of the year. Many spots of Johnston and Ochlockonee soils are included in mapped areas of swamp along the coastal-plain streams, and some Congaree silt loam is included with the swampland along Cape Fear River.

Swamp covers a total area of 56.3 square miles. It occurs in more or less continuous bodies ranging in width from one-tenth mile to 3 miles. The largest are along Waccamaw River, Juniper Creek, Big Swamp, Cape Fear River, Lockwood Folly River, and Town Creek.

Some of the swamp along Cape Fear River was cleared before the Civil War and cultivated to rice, but none of it is now used for cultivated crops, although some areas provide a little pasture. Most of the swampland supports a heavy growth of swamp oak, cypress,

tupelo gum, ash, maple, some poplar, and juniper. The best use of the swampland is forestry

Meadow.—Low-lying poorly drained first-bottom land occurring in narrow strips along some of the smaller streams throughout the county is classed as meadow. The texture of this material is more variable than that of the swamp areas, but meadow and swamp are so closely associated that areas of each are included with areas of the other in mapping. In most areas of meadow the surface layer is dark, and the underlying material is gray or mottled gray and yellow. The surface layer in places is black mucky fine sand. Meadow lies only slightly higher than swamp, and the greater part of it remains permanently wet. It is subject to frequent overflows and in its present condition is not suited to agriculture, although some areas, which are used for pasture, support a growth of reeds and grasses along the edges. The greater part of the land supports a tree growth similar to that on swamp. Some of the meadow could be used for summer pasture, but, aside from pasture, the best use is for forestry.

Tidal marsh.—Tidal marsh comprises marshy grassy areas between the mainland and coastal beach and near the mouths of all the streams emptying into the ocean. In most places the surface layer is dark-gray, bluish-drab, or black loam, oozy loam, silt loam, or heavy fine sandy loam where it borders the coastal beach sand. In many places it is mucky and peaty to a depth ranging from 7 to 24 inches, but in most places it ranges from 6 to 10 inches in thickness. This layer is underlain by drab, bluish-black, or steel-gray soft silty clay or clay, through which the soil auger can be easily pushed down to the handle, and in places gray sand is reached at a depth of about 18 inches.

The relief is level, and all the tidal marsh is subject to tidal overflows. Owing to this condition and also to the excess of salt, none of the land is used for farming. It supports a thick growth of marsh grasses, cattails, and bulrushes and affords some pasture for cattle and hogs. Probably if the land could be diked and the excess salt removed it would produce good rice, corn, and hay.

The largest areas lie near the mouths of Cape Fear, Elizabeth, Lockwood Folly, and Shallotte Rivers and between the upland and areas of coastal beach along the ocean.

Coastal beach.—Coastal beach consists of nearly white, light-gray, or light-brown fine sand or medium sand. Most of the sand is uniformly fine in texture to a depth of several feet. Some sea shells and fragments of shells are scattered over the surface and mixed with the fine sand.

Coastal beach occurs as narrow strips, ranging from 200 feet to nearly one-half mile in width, between the ocean and the tidal-marsh land. The strips are not continuous but are broken in several places by inlets, the most important of which are Cape Fear River Inlet, Shallotte Inlet, and Lockwood Folly Inlet. The elevation of coastal beach ranges from sea level to about 20 feet above. The surface features are irregular, consisting of ridges, dunes, knolls, and depressions, and they are constantly being changed by action of the wind and tides. Where this material is lashed by the tide the surface is smooth and slopes toward the sea.

Coastal beach has no known agricultural value for any crop, but where it joins tidal-marsh land it supports some grass, and where it joins areas of the dark-colored phase of coastal beach it supports some small water oaks or live oaks and other small trees and bushes.

Coastal beach, dark-colored phase.—The dark-colored phase of coastal beach differs from typical coastal beach in that it contains various amounts of organic matter. The color of the surface material ranges from gray to dark gray and, in depressions, to black fine sand or loamy fine sand, extending to a depth ranging from 5 to 10 inches. The underlying material in most places is gray or light-gray fine sand. In places on Smith Island the material is similar to Blanton fine sand and consists of a gray surface soil and a pale-yellow subsoil.

Only a few small spots of the dark-colored phase of coastal beach, near the lighthouses on Smith Island, are cleared. Peaches seem to be the only crop that can be successfully grown. Fig trees grow well, but the fruit drops off before it matures. This land at one time supported a good stand of cedar, but this has been cut for lumber. The present growth consists chiefly of small water oak, live oak, yaupon, some palmetto, and other small trees. The land has only slight agricultural value.

AGRICULTURAL METHODS AND MANAGEMENT

Most of the soils in Brunswick County, including the types of the Norfolk, Ruston, Craven, Dunbar, and Onslow series, are used for the production of those crops best suited to the soils and climate under present economic conditions. The light-colored well-drained fine sandy loams produce most of the agricultural products, and on these soils are grown all the cotton, peanuts, and tobacco, most of the early truck crops, and a large proportion of the hay and forage crops. These soils, although low in content of plant nutrients, respond readily to the beneficial effects of fertilization and the turning under of green-manure crops.

Some of the inherently good soils, such as Bladen loam, Hyde loam, and Congaree silt loam, are barred from agricultural use because of poor drainage. If and when these soils are drained and reclaimed, large yields of corn, soybeans, and hay may be expected. It is true that the various kinds of fine sands, together with Pamlico muck, peat, swamp, and other miscellaneous land types, occupy a large area. These soils are inherently poor in plant nutrients and range from well drained to extremely poorly drained. The best use to which they can be put is forestry, and even some of these land types, such as coastal beach, peat, and some of the muck land, are unsuited to the growing of first-class merchantable timber.

The farmers of this county have selected for their use the well-drained soils or those soils which can be fairly easily drained by small canals and open ditches, but large areas of good soils scattered over the county await reclamation. It can be said that the soils and drainage have, to a considerable extent, influenced the kinds of crops grown.

For a long time the farmers have recognized that the different soils are adapted to different crops, and they have found in their farming

operations that the Norfolk and Ruston soils are the best for the production of bright-leaf tobacco, peanuts, and early truck crops; that the better drained areas of the Dunbar, Onslow, and Craven soils are fairly well suited to growing cotton and peanuts, and in some of the best drained areas to the production of bright-leaf tobacco; and that the Hyde, Portsmouth, and Bladen soils are the best soils for the production of corn, potatoes, soybeans, and oats.

In this favorable climate the well-drained fine sandy loams and, in some places, the loamy fine sands could be used more extensively for the production of early truck crops and winter cover crops. Perhaps one of the main reasons why truck farming has not developed to a greater extent in this county is because of the distance from the main lines of transportation and the lack of local markets. Certainly more of the well-drained soils lying nearest to Wilmington could be profitably used for the production of garden vegetables for that market. In New Hanover County, N. C., the same soils are extensively used for the production of bulbs and such truck crops as cabbage, onions, beets, lettuce, collards, and others.

The soils range from acid to very strongly acid. In order to correct this acidity it is recommended that from 1 to 2 tons of ground limestone or from 1 to 1½ tons of burned lime an acre be broadcast. All the light-colored well-drained soils, that is, the dominant agricultural soils, are deficient in organic matter. The best method of supplying this material is by growing more legumes and cover crops and plowing these under. According to Blair,[4] extension agronomist, the farmers must make greater use of leguminous soil-improvement crops, both to increase the content of organic matter and to draw on the inexhaustible supply of nitrogen in the air. To make these crops effective, it will be necessary to plow some of them under instead of removing everything except the stubble from the soil. The best legumes to improve fine sandy loam soils are soybeans, cowpeas, velvetbeans, lespedeza, crimson clover, vetch, and Austrian winter peas, and for the improvement of the sand soils vetch and *Crotalaria* are recommended.

In table 4 recommendations made by the North Carolina Agricultural Experiment Station for the use of fertilizer for the principal crops grown on many of the farming soils of Brunswick County are given. These recommendations are based on the results of field experiments, over a period of several years, at the substations and on field plots on the extensive and important soils in eastern North Carolina.

[4] BLAIR, E. C. AN OPPORTUNITY—USE RENTED ACRES TO BUILD FERTILE SOILS. N. C. Agr. Col. Ext. Misc. Pamphlet 24, 4 pp. 1935.

TABLE 4.—*Recommendations for the use of fertilizers for the leading crops on the principal*

Soil	Fertilizers [1] recommended for—			
	Corn	Tobacco	Sweet-potatoes	Peanuts
	Pounds	*Pounds*	*Pounds*	*Pounds*
Norfolk fine sandy loam Craven fine sandy loam Ruston fine sandy loam, deep phase Dunbar fine sandy loam Dunbar very fine sandy loam Onslow fine sandy loam	300 of 4–8–4 and 75 to 100 of nitrate of soda when corn is about knee high.	800 of 3–8–6	600 to 800 of 3–8–8.	200 to 250 of 2–8–4 and gypsum on leaves at ing time if pH is mu low 6.5.
Portsmouth fine sandy loam Portsmouth loam Coxville fine sandy loam Coxville loam Bladen loam Plummer fine sandy loam Hyde loam	300 of 4–8–4		800 of 3–8–8	200 of 2–8–4 and 300 of g on leaves at bloomin if pH is much below
Norfolk sand Norfolk fine sand Ruston fine sand Blanton fine sand Leon fine sand Onslow loamy fine sand	350 to 400 of 4–8–4 and 75 to 100 of nitrate of soda as a top dressing.	1,000 of 3–8–6	600 to 800 of 4–8–8.	

[1] Quantities given are acre applications.

Few of the farmers practice a systematic crop rotation leading toward building up their land to a higher state of productivity. The North Carolina Agricultural Experiment Station recommends the following 3-year rotation: First year, corn (for grain) with velvetbeans (for grazing) planted between the corn rows, Abruzzi rye broadcast over the land in the fall (for grazing and turning under); second year, corn (for grain) with soybeans (for seed and grazing, with the vines turned under), oats and vetch sown in the fall; third year, either oats and vetch for hay or soybeans for hay, peanuts (for hay or grazing) or sweetpotatoes, Abruzzi rye and vetch or crimson clover following the sweetpotatoes in the fall.

Another 3-year rotation is: First year, corn; second year, sweetpotatoes; third year, soybeans for seed (the vines being turned under).

The corn crop, whenever possible, is followed by tobacco which is followed by soybeans. According to the experience of some of the best farmers, hairy vetch or soybeans make the soil too rich for tobacco, since the higher light sandy soils are used for this crop. On the darker and heavier soils, crops are rotated and legumes are planted with all crops wherever possible.

In some parts of the county, tobacco frequently follows cotton, and in the third year corn is planted. Either soybeans, velvetbeans, or cowpeas are planted in the rows between the corn or, in some places, sown broadcast. The best farmers recognize that it is highly important to have a leguminous crop in the rotation, either to be turned under while green, or, when soybeans, velvetbeans, and peanuts are planted, to turn under the vines, after the crop has been "hogged off."

The following publications from the North Carolina State College at Raleigh will provide helpful information for the cultivation of the soils in Brunswick County: North Carolina Agricultural College Extension Circulars, 165 Crop Rotations for the Coastal Plain Section of North Carolina, 24 How to Use Lime on the Farm, 127 Soybean Growing in North Carolina, and 57 Soybeans—A Future Economic Factor in North Carolina; North Carolina Department of Agriculture Bulletin 41 (5), Farm Practice with Soybeans; and North Carolina Agricultural College Agronomy Information Circular 11, Results of Soil Building Demonstrations in North Carolina.

SOILS AND THEIR INTERPRETATION

Brunswick County lies in the region of the Red and Yellow soils along the Atlantic seaboard within the flatwoods section of the Atlantic Coastal Plain. About 55 percent of the soils are dark colored and all these, together with some of the light-colored soils, are poorly drained. Over large areas in the western and central parts of the county, natural drainage has not been well established, and in such areas the relief maintains the constructional form of the land as laid down by the sea. In general, these areas are higher than the surrounding soils, still they are so flat that rain water runs off very slowly. The elevation of the county ranges from sea level to about 80 feet above.

All the soils were developed under a forest cover consisting of longleaf and shortleaf pines, some oaks, a few dogwood, considerable cypress, juniper, gums, and pond pine, and in many places a thick undergrowth of briers, baybushes, other bushes, and wire grass. All

the well-drained soils and some of the poorly drained soils are light colored and contain only a small quantity of organic matter. In some places in the wooded areas, a thin layer of leaf mold covers the surface or a small amount of organic matter is in the topmost 2- or 3-inch layer of the surface soil of the normally well-drained soils. In some of the poorly drained soils, such as the Portsmouth and Hyde, the surface soil, to a depth ranging from 6 to 15 inches, contains a large amount of organic matter which has accumulated through the growth and decay of vegetation over a long period.

The soils range from medium acid to very strongly acid, the dark-colored and more poorly drained soils being the most acid. Some of these soils have a pH value ranging from 3.8 to 4.6 (table 5, p. 39). The light-colored well-drained soils have been subjected to considerable leaching of the mineral plant nutrients by rain water. On account of the generally level relief, very little erosion has taken place, and this is confined to the steeper slopes and breaks bordering the streams, swamps, or tidal-marsh areas. In a few places along Cape Fear River, the action of waves is cutting back into the upland.

The soils of this county may be divided broadly into two groups—mineral soils and cumulose, or organic, soils. The mineral soils comprise about 85 percent of the total area. Most of the soils are embryonic, or young, as regards profile development, that is, only very small areas have developed a normal soil profile. The various stages of soil development constituting an ascending series from the youngest soils to the most mature are as follows: Swamp or tidal marsh, Portsmouth, Bladen, Coxville, Dunbar, Norfolk, and Ruston. Norfolk fine sandy loam and Ruston fine sandy loam, deep phase, may be considered the only soils having a normally developed profile. In these soils the light texture of the A horizon indicates that considerable eluviation has taken place, whereas the B horizon, or the seat of deposition or accumulation of the fine materials, shows evidence of illuviation. The B horizon is uniform in color and structure, and the change from the material of the B horizon to that of the C horizon is marked.

The soils of this county have been derived, through the soil-forming processes, from beds of unconsolidated clays, sandy clays, and fine sands. These materials differ considerably from place to place. Some of the material is rather hard and compact, but brittle, and in places shows stratification or bedding. The parent materials underlying the Norfolk, Ruston, Onslow, and Blanton soils consists mainly of fine sandy clays, interbedded with fine sands, whereas the parent materials underlying the Bladen, Craven, Dunbar, and Coxville soils are heavy clays and consist of beds of clays or heavy fine sandy clays, which are dominantly gray, with mottlings of brown and yellow. The character of the parent materials has influenced largely the heaviness or character of the B horizons and, in some places, the A horizons of the extensive and important soils. Owing to poor drainage, aeration, and oxidation, as a result of the high water table, most of the soils of this county have not developed normal soil profiles.

Following is a description of a profile of Norfolk fine sandy loam, observed one-half mile south of North West:

A_1. 0 to 3 inches, dark-gray loamy fine sand containing enough organic matter to produce the dark color.

A_2. 3 to 15 inches, pale-yellow heavy loamy fine sand. This layer, together with the A_1 layer, constitutes the eluviated horizon. The material has a single-grained structure.
B. 15 to 34 inches, yellow fine sandy clay which is mellow, friable, of uniform color, and lacks definite structural characteristics. It crumbles readily to a friable mealy mass. This is the illuviated horizon.
C. 34 to 50 inches +, mottled yellow, light-gray, and light-red sticky fine sandy clay.

The soils of the Ruston series differ essentially from those of the Norfolk series, in that the B horizon is yellowish-red or yellowish-brown friable fine sandy clay and the underlying material is yellowish-brown very friable fine sandy clay or pale-yellow fine sand.

The soils of the Dunbar series differ from those of the Norfolk series, in that the surface soil is more nearly fine sandy loam or very fine sandy loam and the underlying material is heavier and becomes noticeably mottled at a depth ranging from 18 to 24 inches, where it grades into mottled yellow and gray heavy fine sandy clay containing some red splotches.

The soils of the Onslow series are characterized by a 1- to 4-inch brown compact layer a few inches below the surface, consisting of fine sand or silt which has been cemented by organic matter or a small amount of iron. In some places the material in this layer is merely brown-stained loamy fine sand.

The principal differences between the soils of the Craven series and those of the Norfolk series is that the B horizon of the Craven soils is heavy slightly plastic tough clay which, in exposed cuts, on drying breaks into irregular-shaped very hard lumps.

Following is a description of a profile of Leon fine sand, a so-called Ground-Water Podzol, observed one-half mile north of Moors Creek on State Highway No. 303:

0 to 5 inches, gray fine sand containing enough organic matter to produce the gray color.
5 to 18 inches, light-gray or almost white loose and incoherent fine sand.
18 to 30 inches, black, dark-brown, or coffee-brown hardpan, the upper 1 or 2 inches of which is black and very hard and the lower part dark brown, becoming lighter brown and more friable toward the bottom of the layer. The hardpan consists of fine sand cemented with organic matter.
30 to 50 inches, grayish-brown or brown fine sand grading imperceptibly into stained brown fine sand and thence into gray fine sand.

The soils of the St. Johns series differ from those of the Leon series in that they have black surface soils, owing to the presence of a large quantity of organic matter, and are poorly drained. The black layer either rests on the hardpan or, in some places, on a thin layer of light-gray fine sand which occurs between the black surface layer and the hardpan.

Following is a description of a profile of Bladen loam, observed about one-half mile west of Mills Creek on State Highway No. 303:

0 to 9 inches, dark-gray or grayish-brown loam containing a considerable amount of organic matter. When wet this material is almost black.
9 to 18 inches, drab or yellowish-gray fine sandy clay streaked and splotched with rust-brown mottles.
18 to 65 inches, steel-gray heavy plastic clay mottled and streaked with brownish yellow or ocher yellow.

The steel-gray color of the third layer becomes more pronounced with depth. The clay material is sticky and plastic when wet and can easily be pulled from the grooves of the soil auger without break-

ing. On drying the clay breaks into cubes or irregular-shaped lumps, ranging from one-fourth inch to 2 inches in diameter, and it shows a slight gray coloration along breakage lines.

The Coxville soils differ from the Bladen soils in that the surface material is light in color and the underlying material is mottled yellow and gray heavy fine sandy clay or clay, splotched with bright red.

The Congaree and Ochlockonee soils are developed in the first bottoms and are subject to frequent overflows. The Congaree soils occur in the northern part of the county along Cape Fear River north of Navassa. They are developed from sediments brought down from the piedmont-plateau region and from the Atlantic Coastal Plain region and deposited by this river. The Ochlockonee soils have been formed by the deposition of material washed from the soils of the Atlantic Coastal Plain region.

The soils of the Portsmouth, Hyde, and Johnston series are characterized by black surface soils, and the Hyde soil is black to a depth of 3 feet or deeper. The Hyde and Portsmouth soils owe their origin to Atlantic Coastal Plain materials and are upland soils, whereas the Johnston soils occur in the first bottoms and have been formed from materials washed from the Atlantic Coastal Plain soils and deposited by the streams.

The cumulose, or organic, soils are mapped as Pamlico muck, Pamlico muck, shallow phase, peat, and peaty muck. These soils occur in large areas and are confined to the western part of the county. Peat consists almost entirely of organic matter, that is, brown fibrous organic remains, such as leaves, twigs, moss, and fine roots. It is much more fibrous than Pamlico muck. The organic material giving rise to Pamlico muck is fairly well decomposed, is black, and contains considerable very fine sand and silt.

Meadow, swamp, tidal marsh, and coastal beach are largely deposits of mineral materials. Meadow, although wet the greater part of the time, is not so wet as swamp. These materials occur in the first bottoms along the streams. Tidal marsh, which is salty, lies between coastal beach areas and the mainland. Coastal beach is light-brown fine sand composing the present beach along the ocean.

Table 5 gives the pH values of several soils. The determinations were made in the laboratories of the Bureau of Chemistry and Soils by the hydrogen-electrode method.

TABLE 5.—*pH determinations of several soils from Brunswick County, N. C.*

Soil type and sample no.	Depth	pH	Soil type and sample no.	Depth	pH
Onslow fine sandy loam:	*Inches*		Norfolk fine sandy loam:	*Inches*	
238201	0–3	4.1	238207	0–3	4.5
238202	3–5	4.2	238208	3–15	4.8
238203	5–9	4.7	238209	15–34	4.8
238204	9–18	4.8	238210	34–50	4.7
238205	18–34	4.6	Leon fine sand:		
238206	34–60	4.6	238211	0–5	4.2
St. Johns fine sand:			238212	5–18	4.9
238215	0–2	3.7	238213	18–38	4.2
238216	2–13	3.8	238214	38+	4.4
238217	13–18	4.3	Portsmo th fine sandy loam:		
238218	18–32	3.9	238226	0–14	4.4
238219	32+	4.6	238227	14–40	4.5
			238228	40–60	4.6

SUMMARY

Brunswick County is the most southerly county in North Carolina. It lies along the Atlantic Ocean and borders the State of South Carolina. It is located in the seaward, or flatwoods, part of the Atlantic Coastal Plain. The elevation ranges from sea level to 80 feet above. The relief is, in general, level or undulating, with some gently rolling and sloping areas, interspersed with many bays and depressions. Probably not more than 30 percent of the land is naturally well drained. All the drainage is effected, through Cape Fear and Waccamaw Rivers and their tributaries, into the Atlantic Ocean.

The climate is mild and pleasant. Rainfall is abundant and well distributed throughout the year. No county in North Carolina has a more favorable climate for growing a wide variety of farm crops, truck crops, and winter vegetables.

One of the outstanding features of this county, as reported by the 1935 census, is that only slightly more than 6 percent of the total area is cleared and under cultivation. This low percentage of land in use is due to two important factors, namely, inadequate drainage and large areas of poor soils. The many different soils range in agricultural value from inherently the poorest to some of the best in the Atlantic Coastal Plain section of the State.

There is a large aggregate acreage of various types of fine-textured sand, large areas of Pamlico muck and peat, and a considerable area of swamp, tidal marsh, and coastal beach. The group of miscellaneous land types constitutes, in the main, soils so inherently poor as to preclude them from being used for the production of crops, and their only use is for forestry. Some of them even do not grow trees suitable for commercial timber.

Another group of soils, which comprise a large acreage, includes the soils of the Bladen, Coxville, Hyde, Congaree, Ochlockonee, and some types of the Portsmouth series. These are naturally good soils, capable of producing large yields of certain crops, but they are barred, for the most part, from use by adverse drainage conditions. With the exception of the soils of the first bottoms, all these soils can be drained and reclaimed for agricultural purposes by canals and open lateral ditches.

The soils which dominate the agriculture of Brunswick County and produce the greater part of all the agricultural products are the light-colored fine sandy loams of the Norfolk, Ruston, Craven, Onslow, and Dunbar series. These soils are for the most part naturally well drained, warm up quickly in the spring, and respond to the application of commercial fertilizers and to the turning under of green-manure crops.

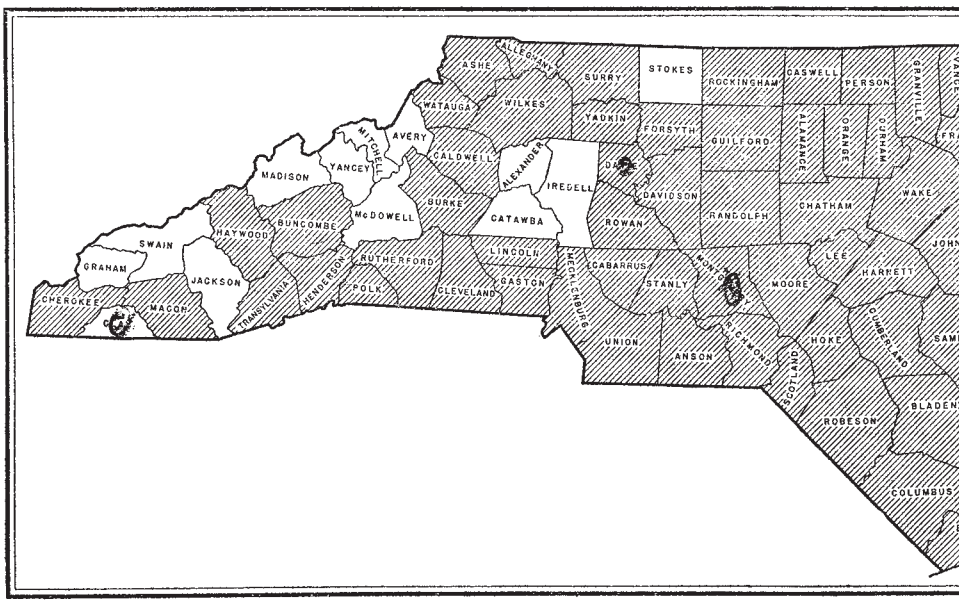
The good physical properties of these soils, together with the favorable climate, adapt them to the production of bright-leaf tobacco, peanuts, cotton, sweetpotatoes, and truck crops, which are the main cash crops of the farmers in this county. Corn, sweetpotatoes, hay for forage, cowpeas, soybeans, velvetbeans, and garden vegetables comprise the subsistence crops.

If and when it is necessary to produce more truck crops to meet the demands and also to grow more of the staple crops, the soils and climate offer advantages for further expansion in the cultivated acreage.

U. S. GOVERNMENT PRINTING OFFICE: 1937

Authority for printing soil survey reports in this form is carried in the Appropriation Act for the Department of Agriculture for the fiscal year ending June 30, 1933 (47 U. S. Stat., p. 612), as follows:

There shall be printed, as soon as the manuscript can be prepared with the necessary maps and illustrations to accompany it, a report on each soil area surveyed by the Bureau of Chemistry and Soils, Department of Agriculture, in the form of advance sheets bound in paper covers, of which not more than two hundred and fifty copies shall be for the use of each Senator from the State and not more than one thousand copies for the use of each Representative for the congressional district or districts in which a survey is made, the actual number to be determined on inquiry by the Secretary of Agriculture made to the aforesaid Senators and Representatives, and as many copies for the use of the Department of Agriculture as in the judgment of the Secretary of Agriculture are deemed necessary.



Areas surveyed in North Carolina, shown by shading. Detailed surveys shown b

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Washington, D.C. 20250-9410;

(2) fax: (202) 690-7442; or

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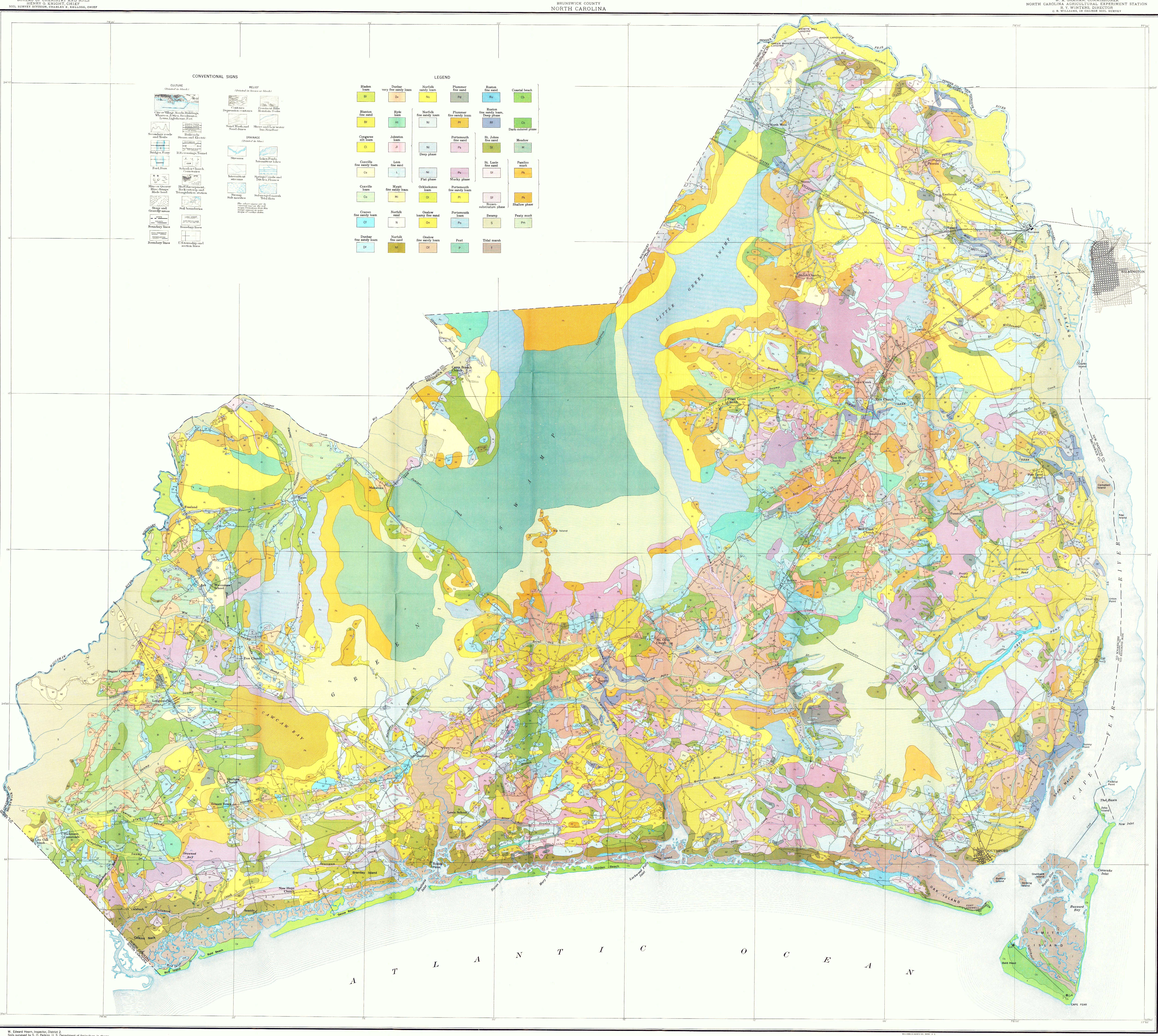
U. S. DEPARTMENT OF AGRICULTURE
BUREAU OF CHEMISTRY AND SOILS
HENRY G. KNIGHT, CHIEF
SOIL SURVEY DIVISION, CHARLES E. KELLOGG, CHIEF

SOIL MAP
BRUNSWICK COUNTY
NORTH CAROLINA

NORTH CAROLINA DEPARTMENT OF AGRICULTURE
W. A. GRAHAM, COMMISSIONER
NORTH CAROLINA AGRICULTURAL EXPERIMENT STATION
R. Y. WINTERS, DIRECTOR
C. B. WILLIAMS, IN CHARGE SOIL SURVEY



W. Edward Hearn, Inspector, District 2.
Soils surveyed by S. O. Perkins, U. S. Department of Agriculture, in charge, and E. F. Goldston, North Carolina Department of Agriculture and North Carolina Agricultural Experiment Station.

Scale 1 inch - 1 mile

Field Operations
Bureau of Chemistry and Soils
1932